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(12) **United States Patent**
Hochstrate et al.

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(45) **Date of Patent: Dec. 31, 2019**

(54) **FIREARM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 498 days.

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(22) Filed: **Aug. 1, 2016**

(65) **Prior Publication Data**

US 2017/0138686 A1 May 18, 2017

Related U.S. Application Data

(63) Continuation of application No. 14/307,315, filed on Jun. 17, 2014, now Pat. No. 9,404,694.

(60) Provisional application No. 61/868,427, filed on Aug. 21, 2013.

(51) **Int. Cl.**

F41A 11/02	(2006.01)
F41A 3/26	(2006.01)
F41A 9/65	(2006.01)
F41A 15/14	(2006.01)
F41A 17/38	(2006.01)
F41A 19/13	(2006.01)
F41A 3/66	(2006.01)
F41A 9/61	(2006.01)

(52) **U.S. Cl.**

CPC ***F41A 11/02*** (2013.01); ***F41A 3/26*** (2013.01); ***F41A 3/66*** (2013.01); ***F41A 9/61*** (2013.01); ***F41A 9/65*** (2013.01); ***F41A 15/14*** (2013.01); ***F41A 17/38*** (2013.01); ***F41A 19/13*** (2013.01)

(58) **Field of Classification Search**

CPC F41A 11/02; F41A 3/26; F41A 3/66; F41A 9/61; F41A 17/38

USPC 42/17, 75.02

See application file for complete search history.

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Primary Examiner — Joshua E Freeman
Assistant Examiner — Bridget A Cochran
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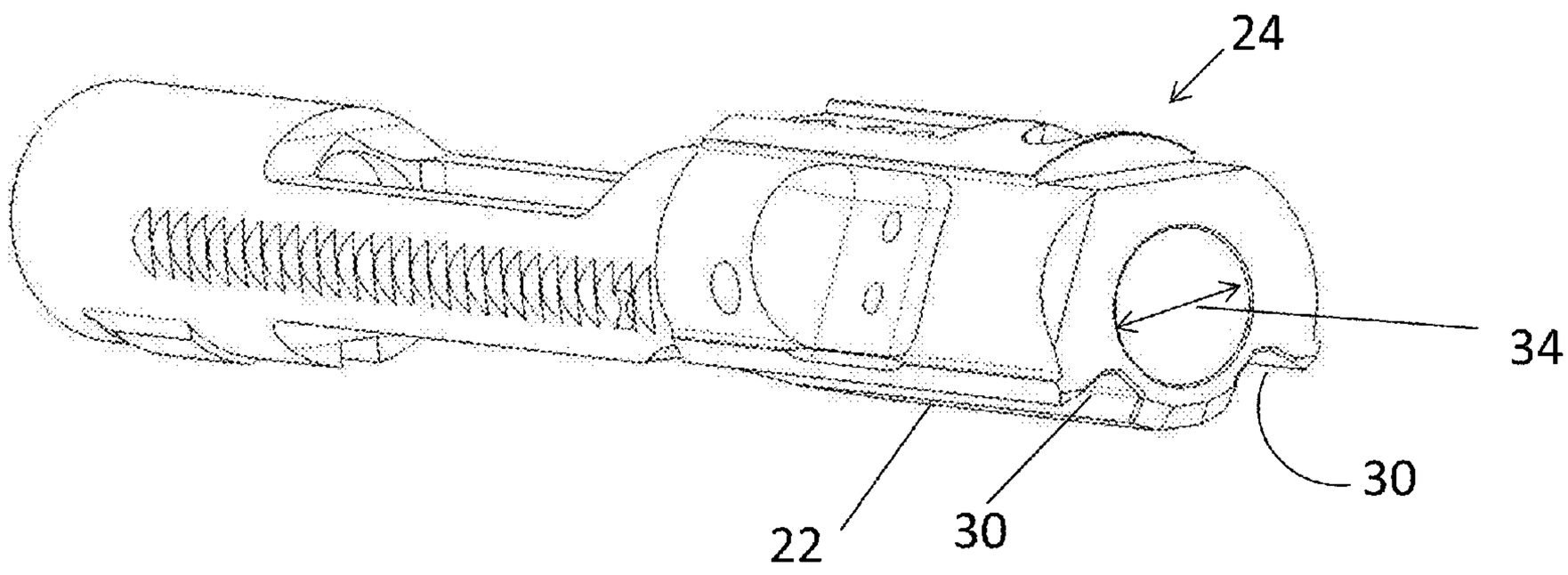
(57) **ABSTRACT**

A rifle configured for firing a 7.62×39 mm round is provided. The rifle having: an upper receiver; a lower receiver, the upper receiver being removably secured to the lower receiver, wherein the lower receiver is configured to removably receive and secure a magazine therein, the magazine being configured to hold at least 30 rounds of a 7.62×39 mm ammunition; and wherein a magazine well of the lower receiver is configured to receive an adapter at a front of the lower receiver.

16 Claims, 23 Drawing Sheets



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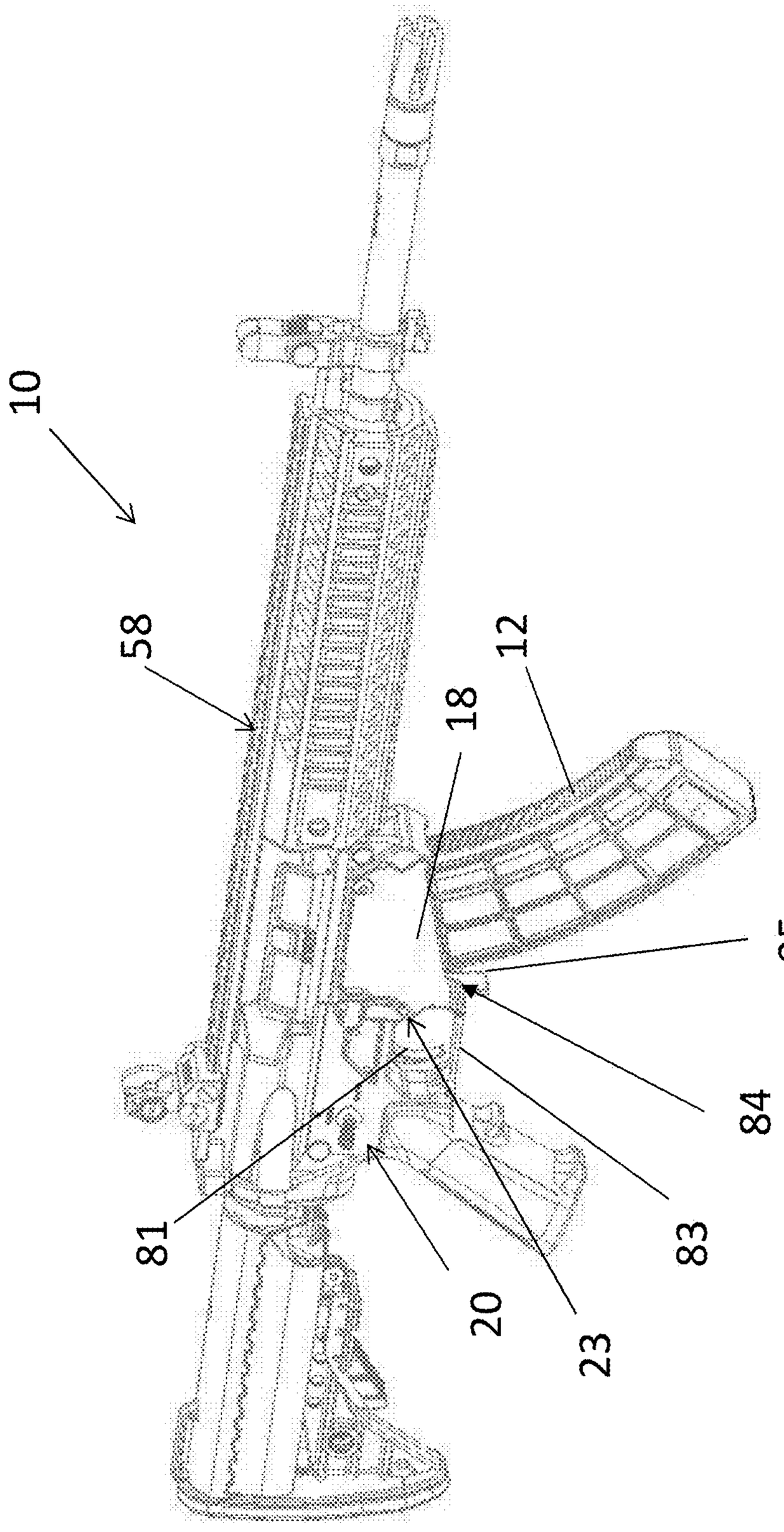

FIG. 1

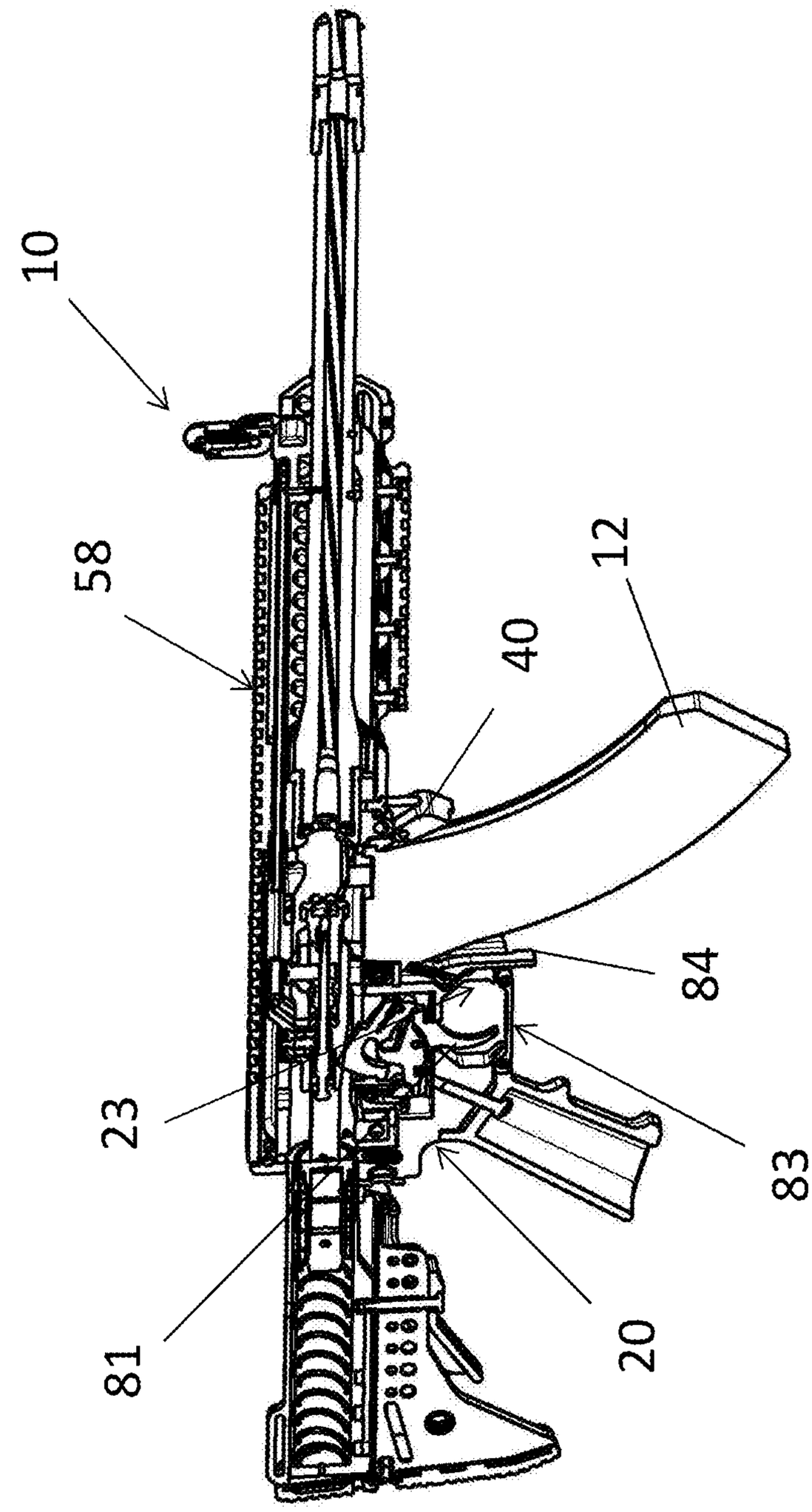

FIG. 1A

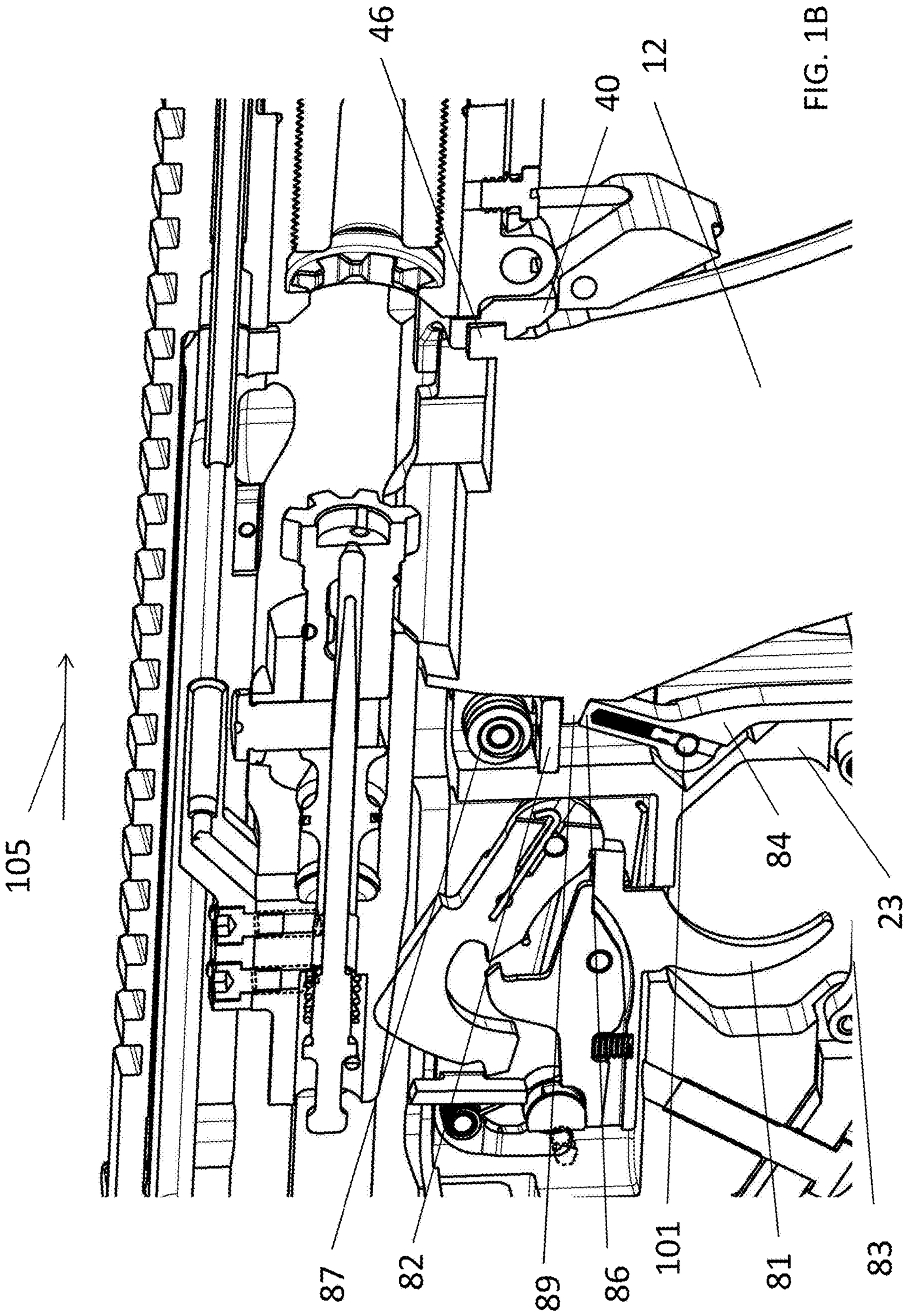

FIG. 1B

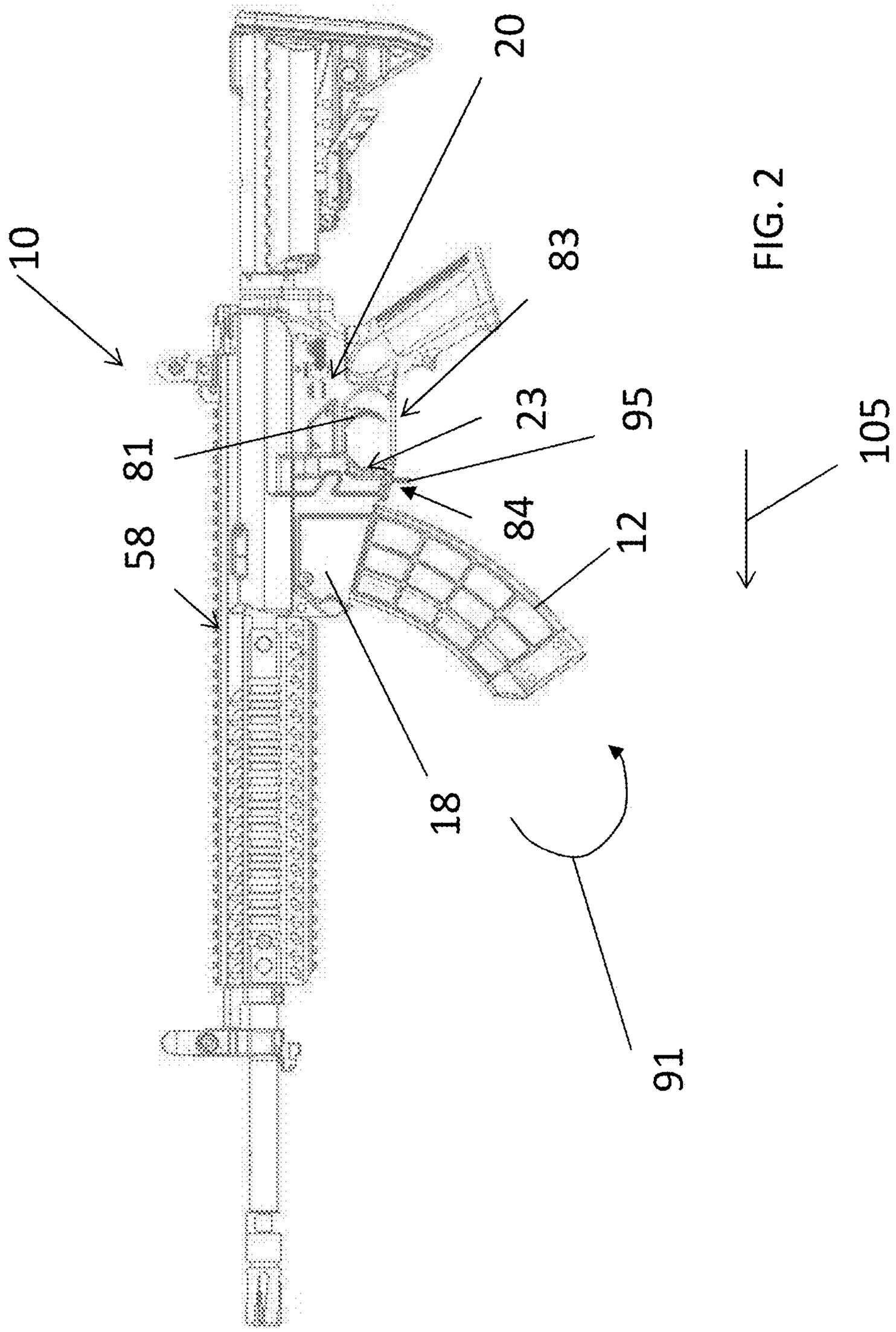

FIG. 2

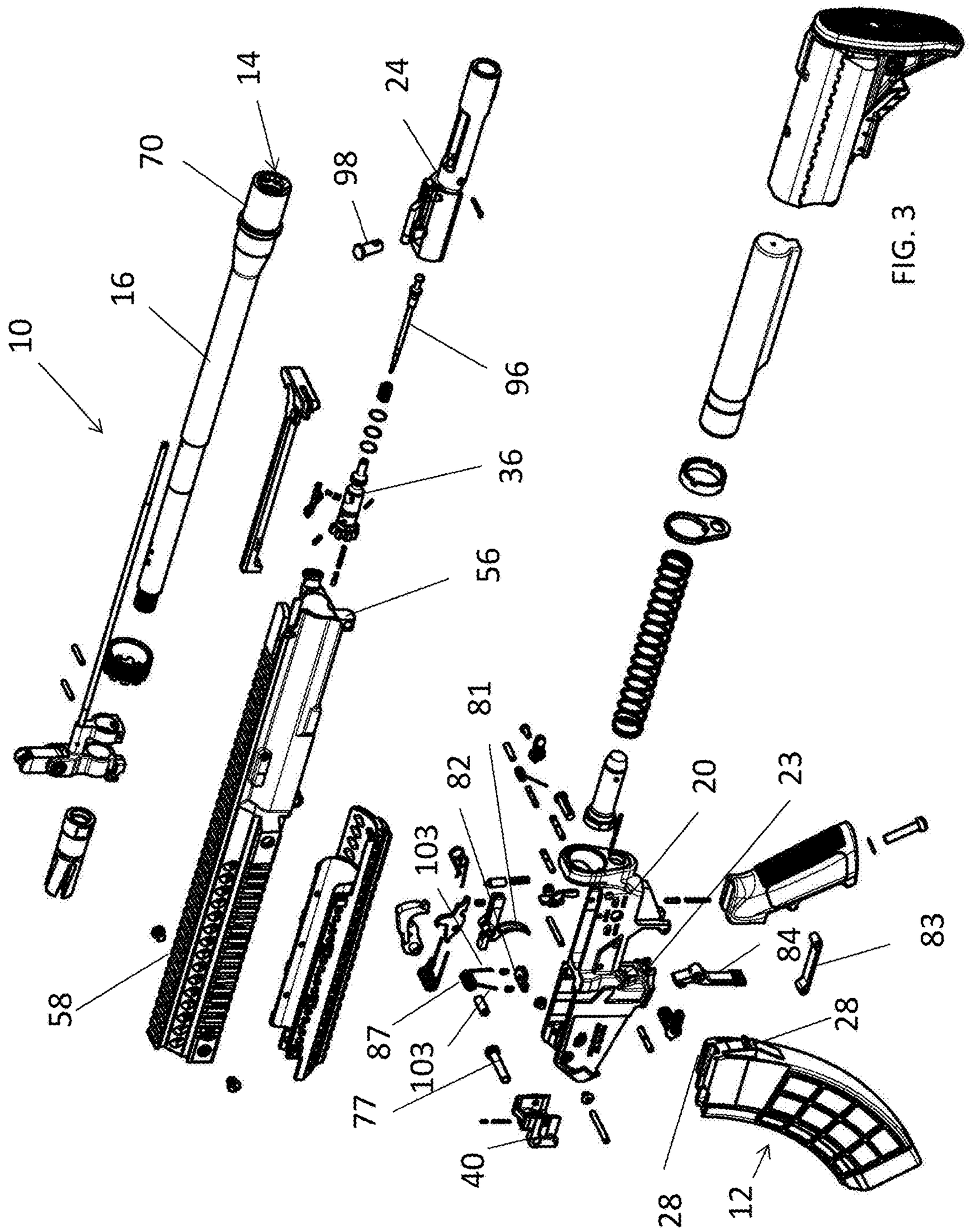
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FIG. 3

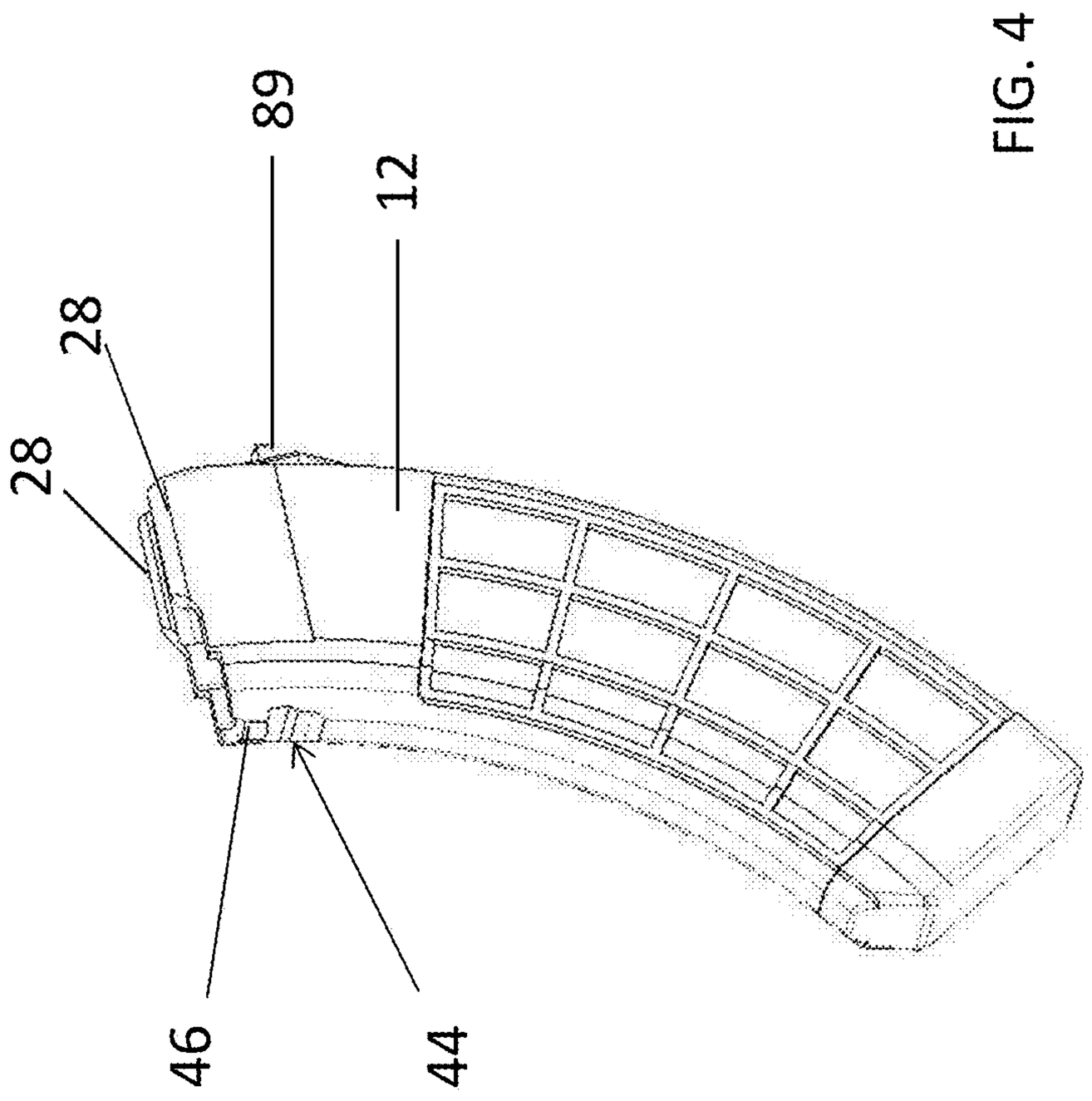


FIG. 4

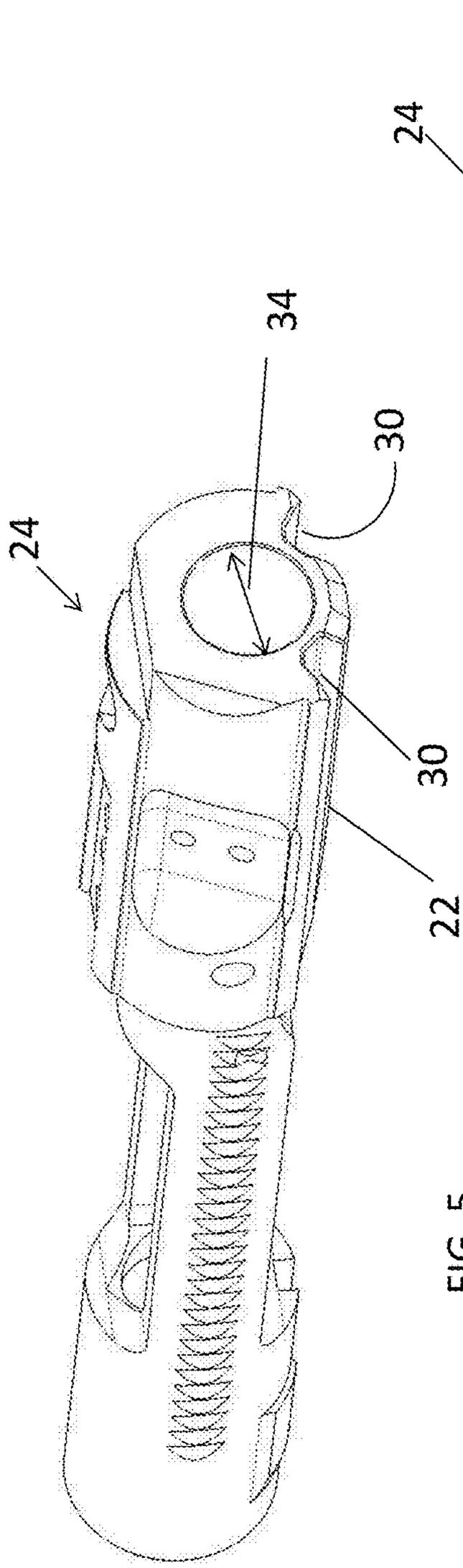


FIG. 5

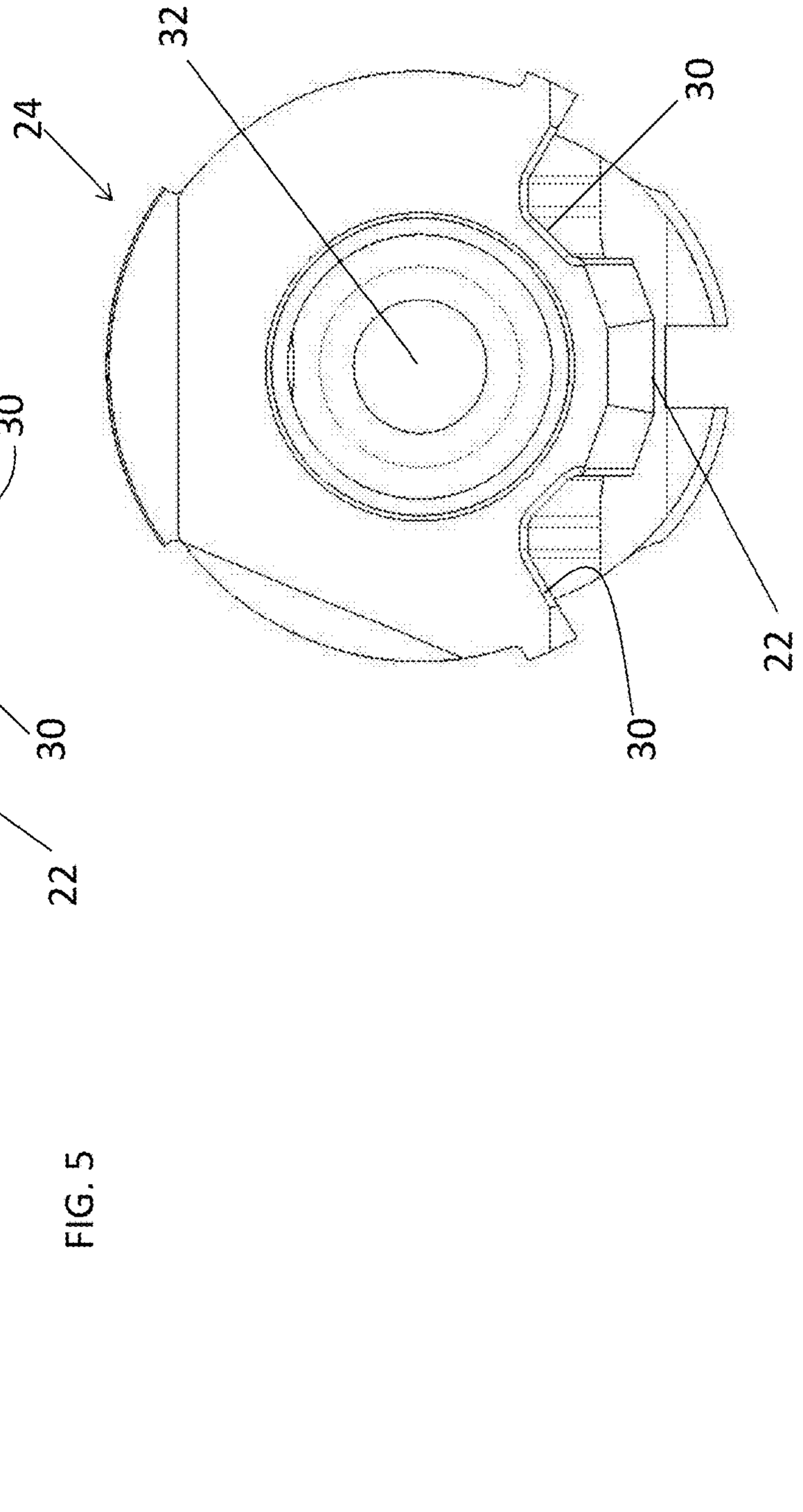


FIG. 5A

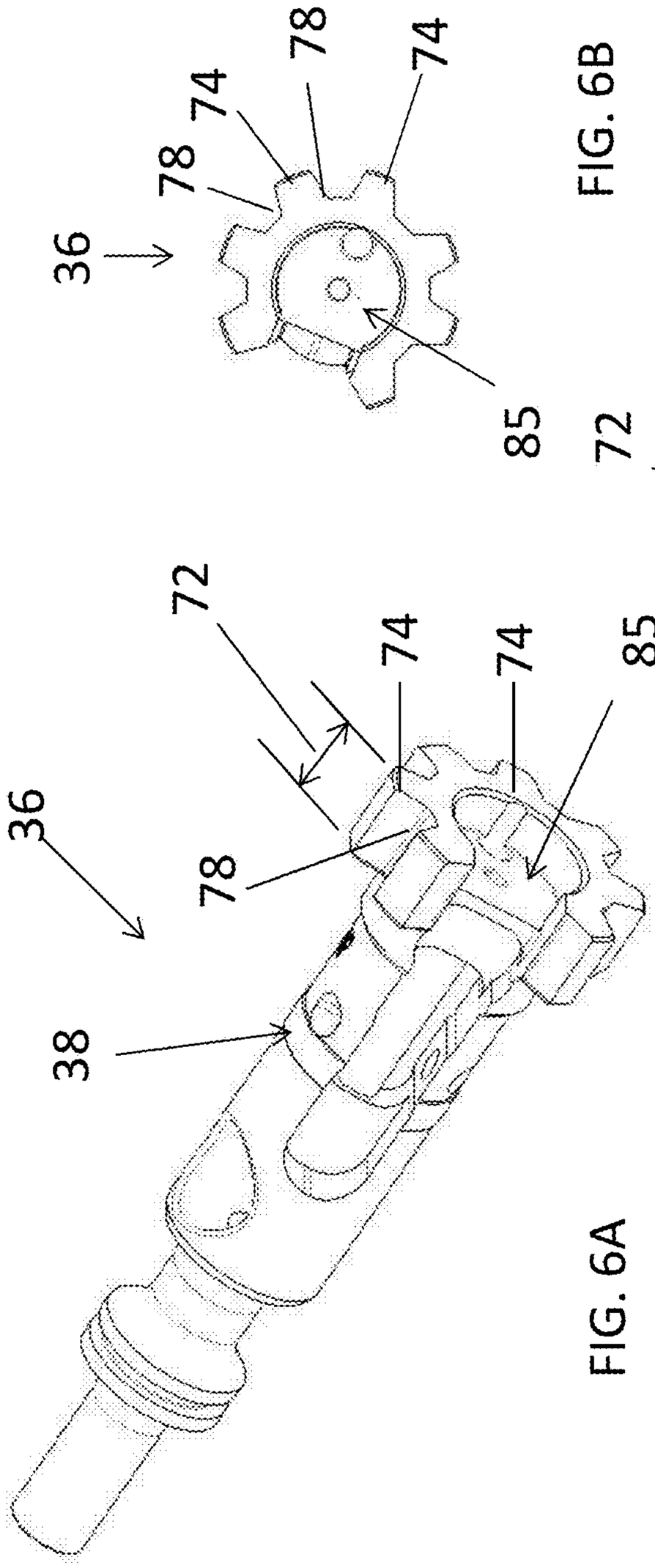


FIG. 6A

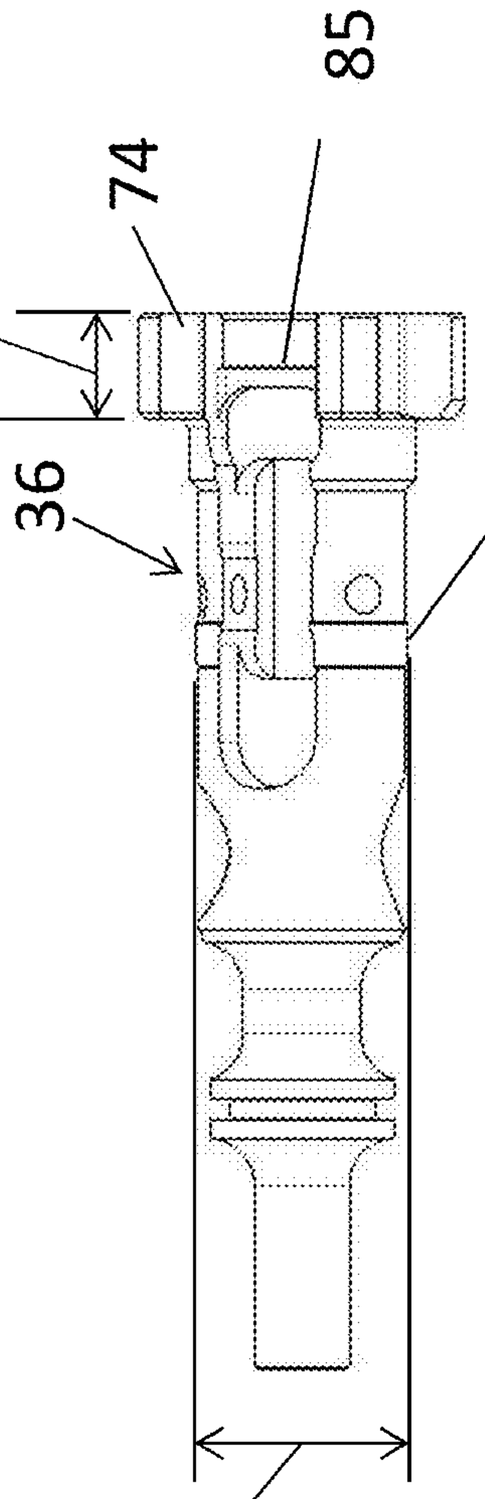


FIG. 6C

FIG. 6B

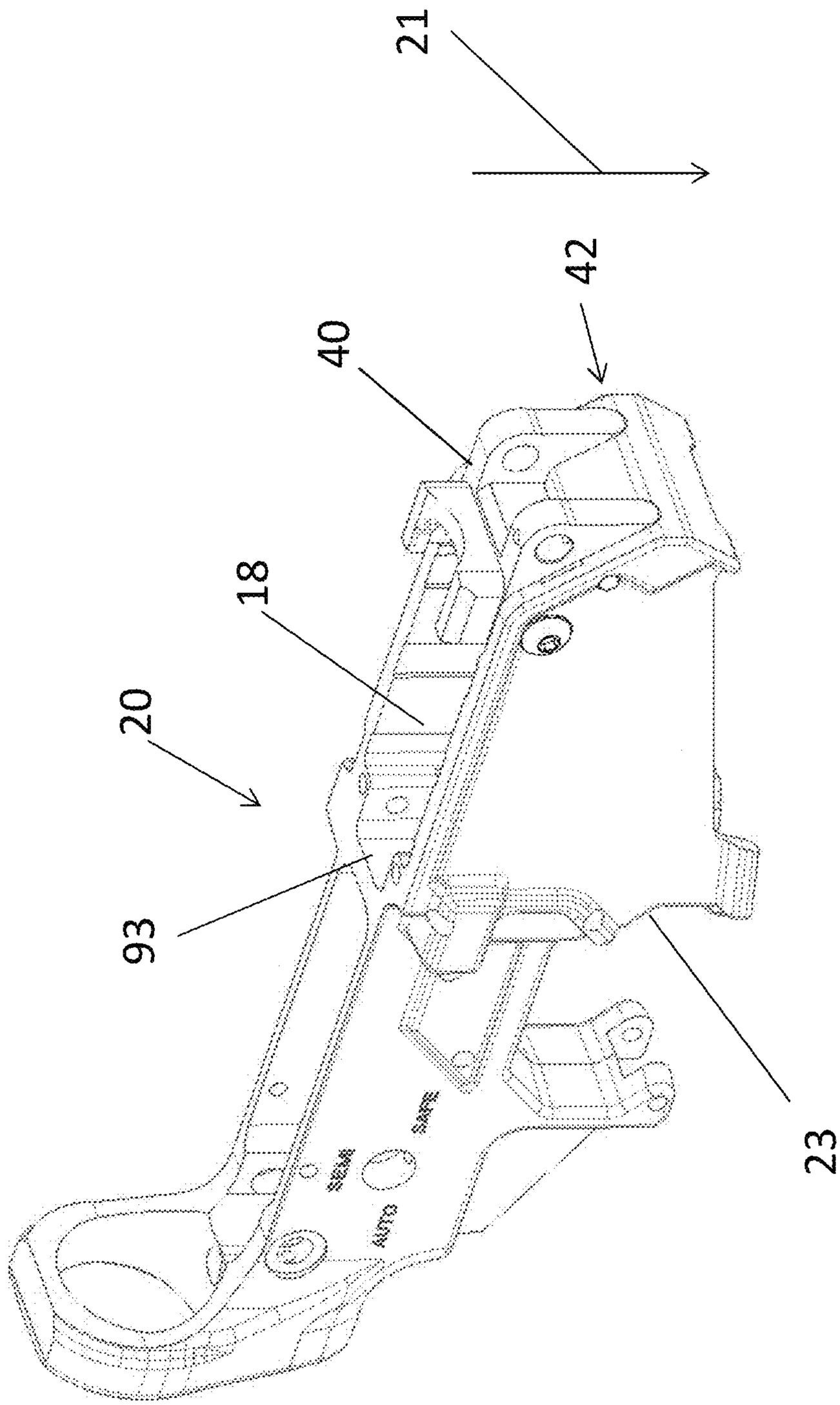


FIG. 7A

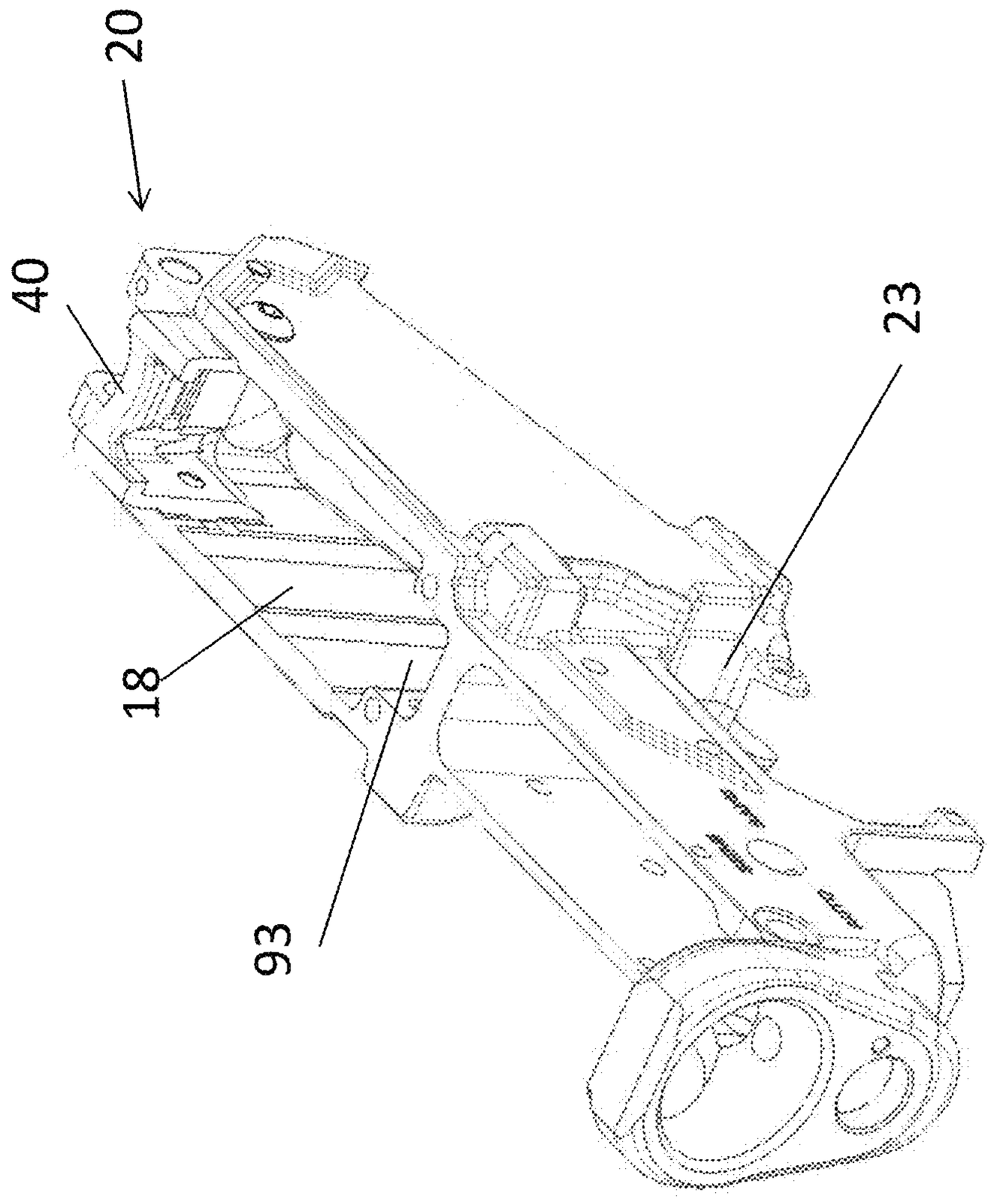


FIG. 7B

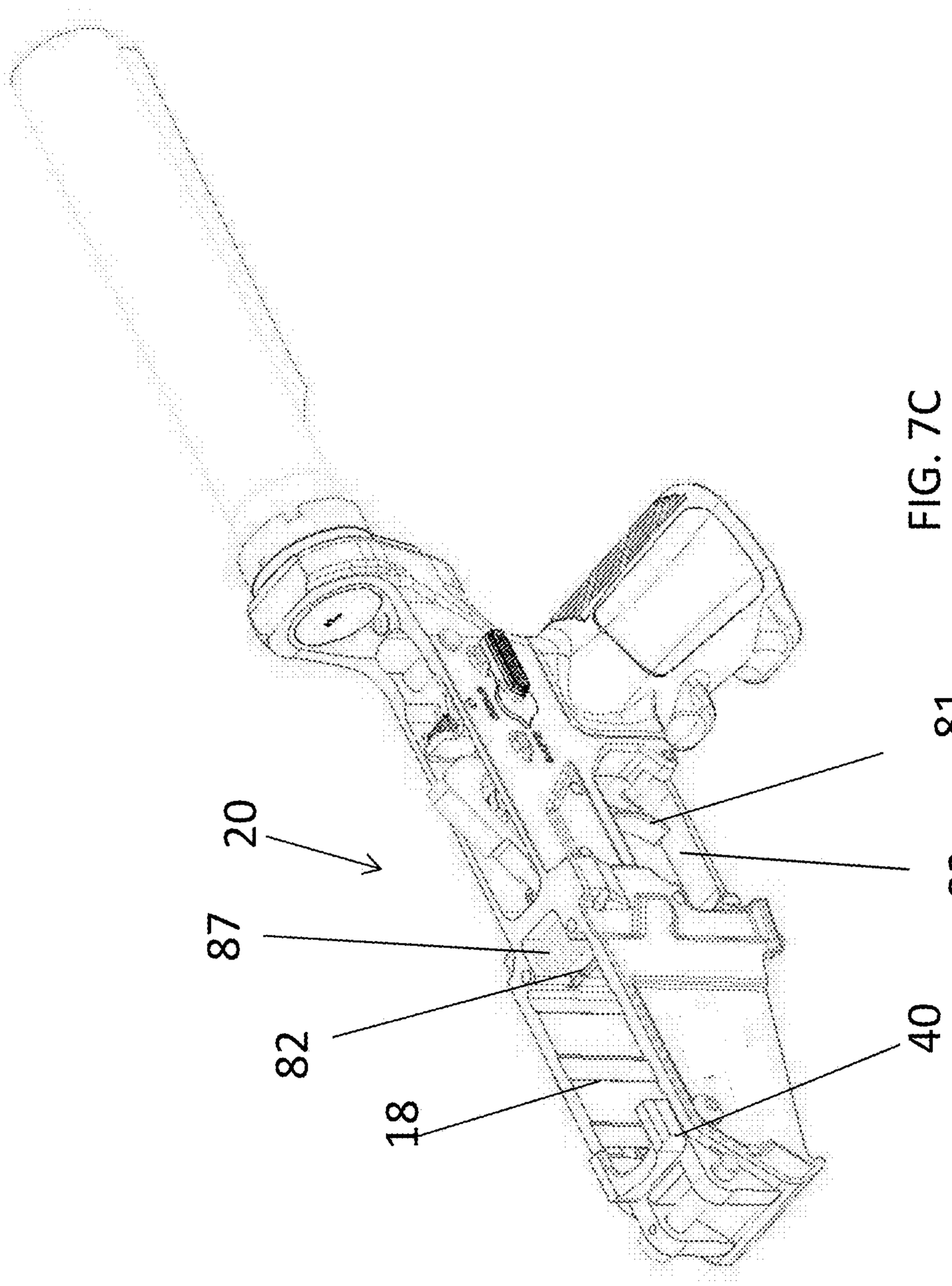


FIG. 7C

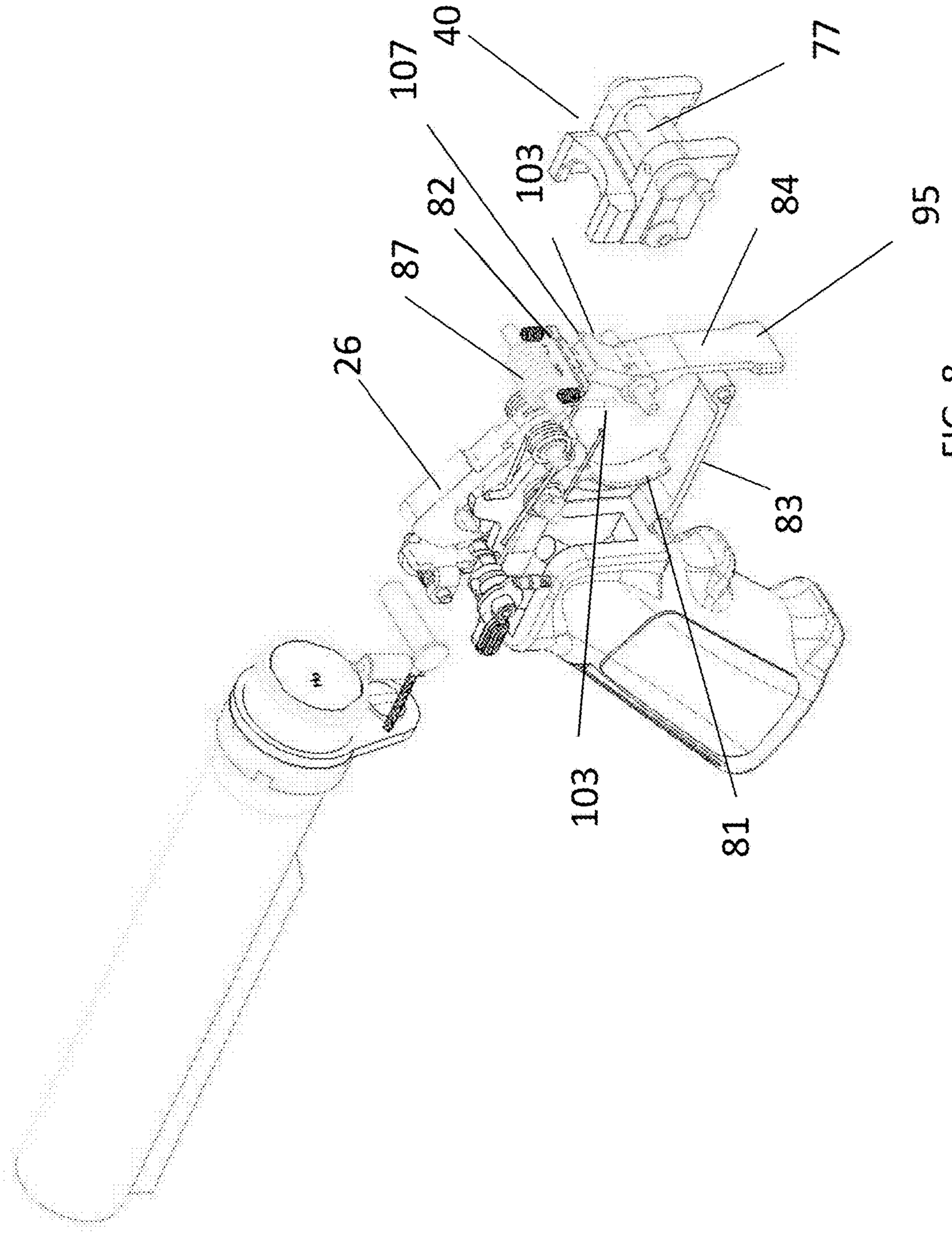


FIG. 8

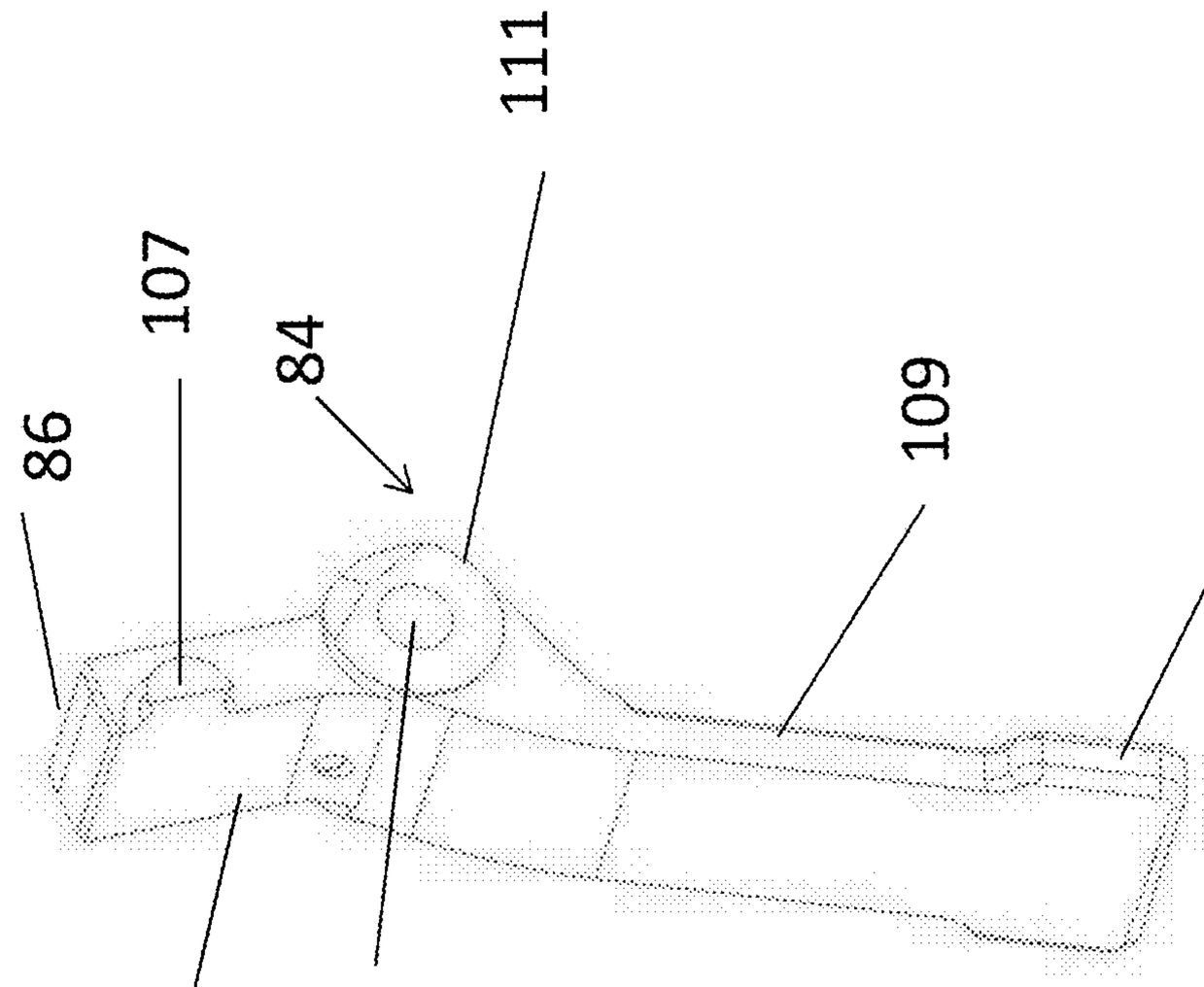


FIG. 9B

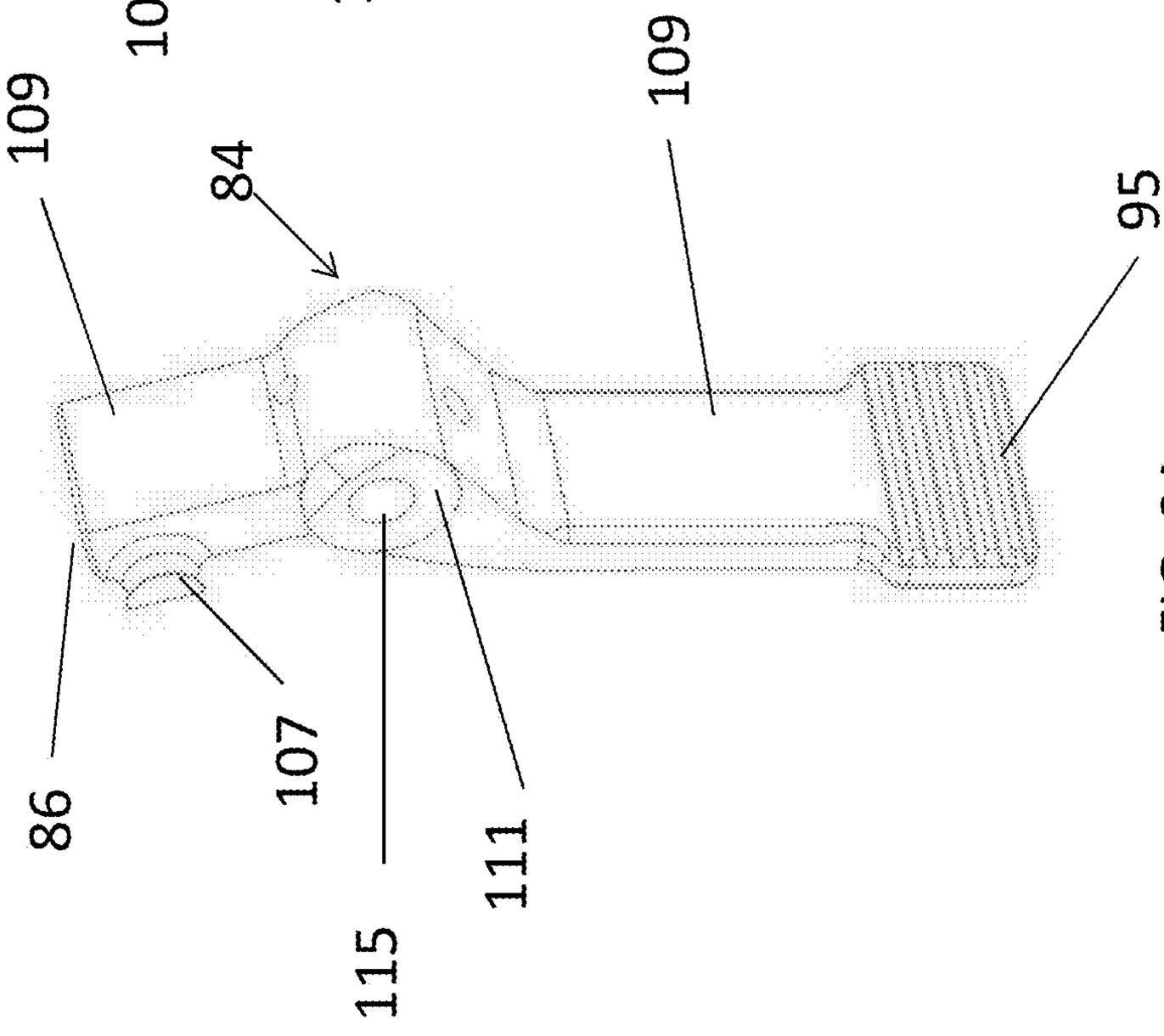


FIG. 9A

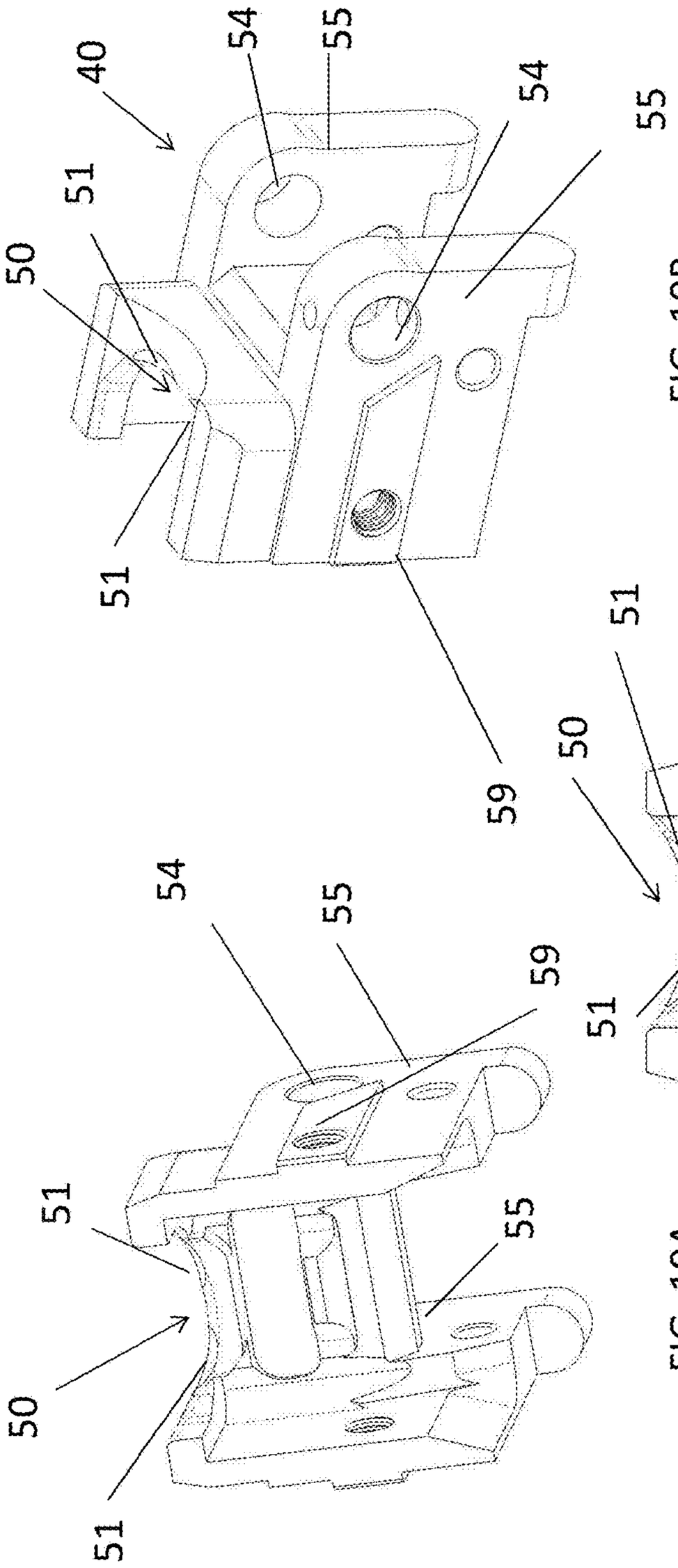


FIG. 10A

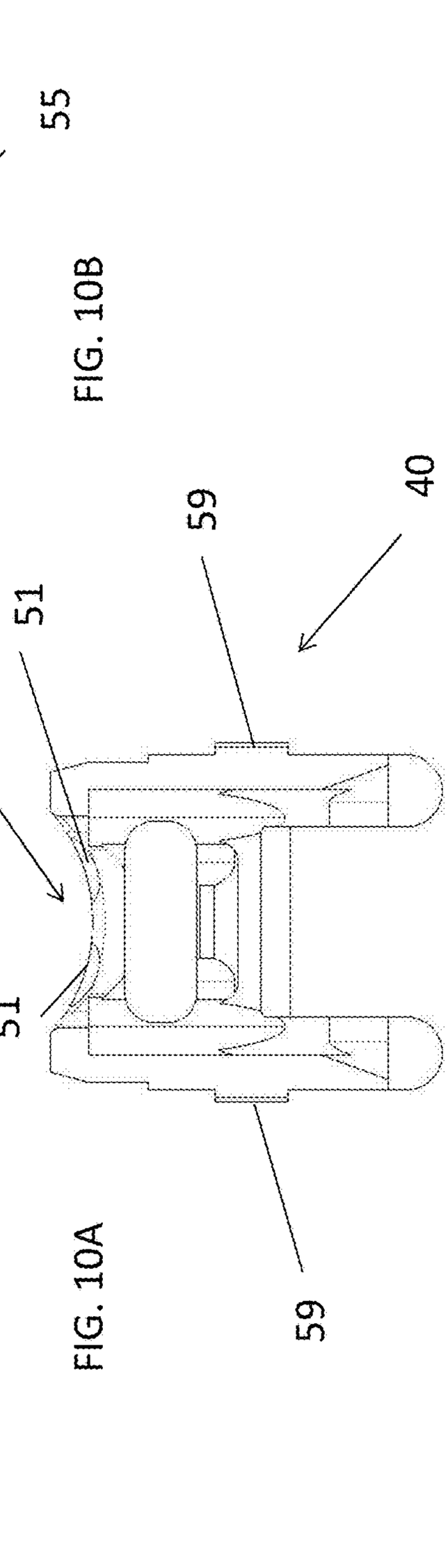


FIG. 10B

FIG. 10C

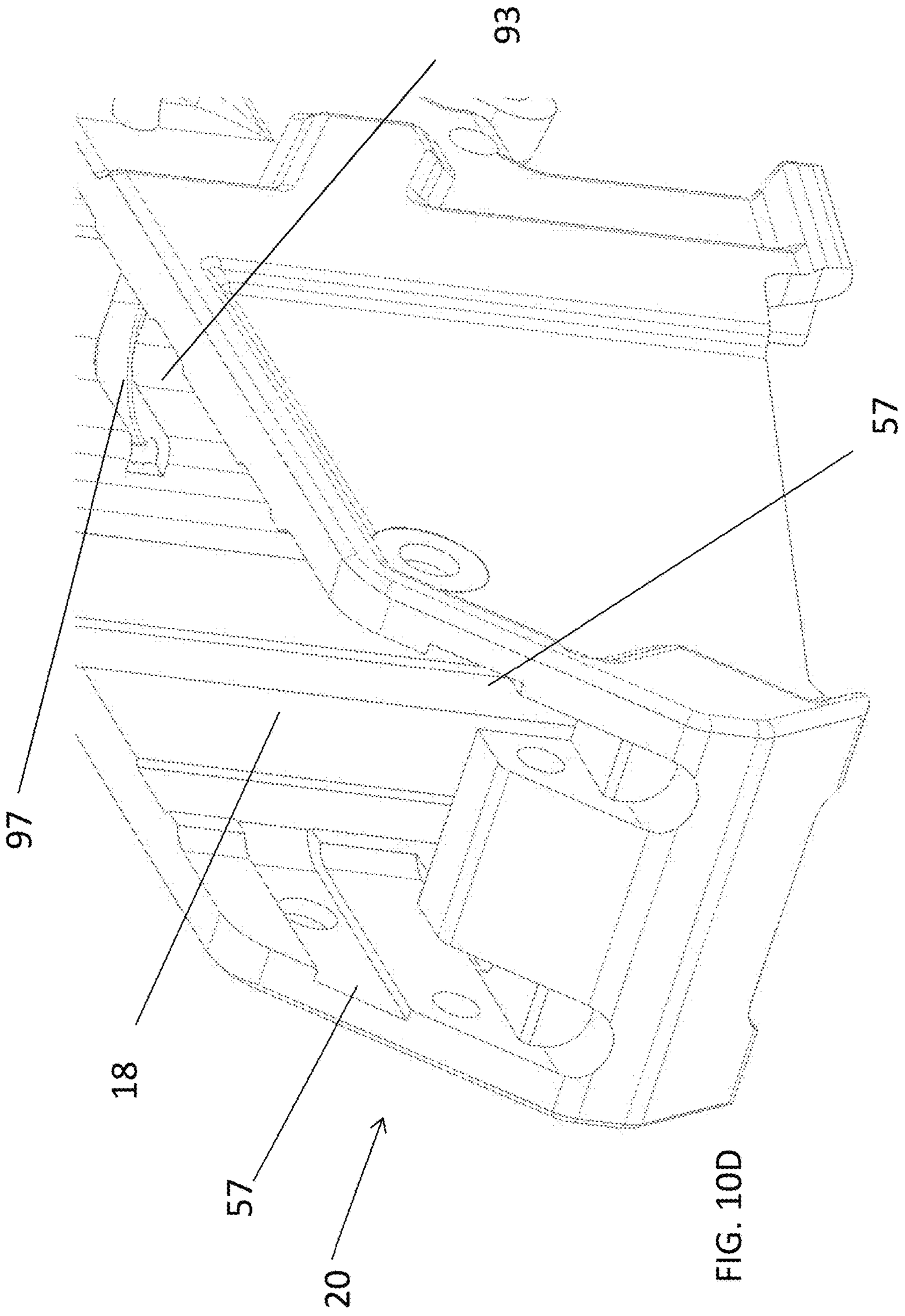


FIG. 10D

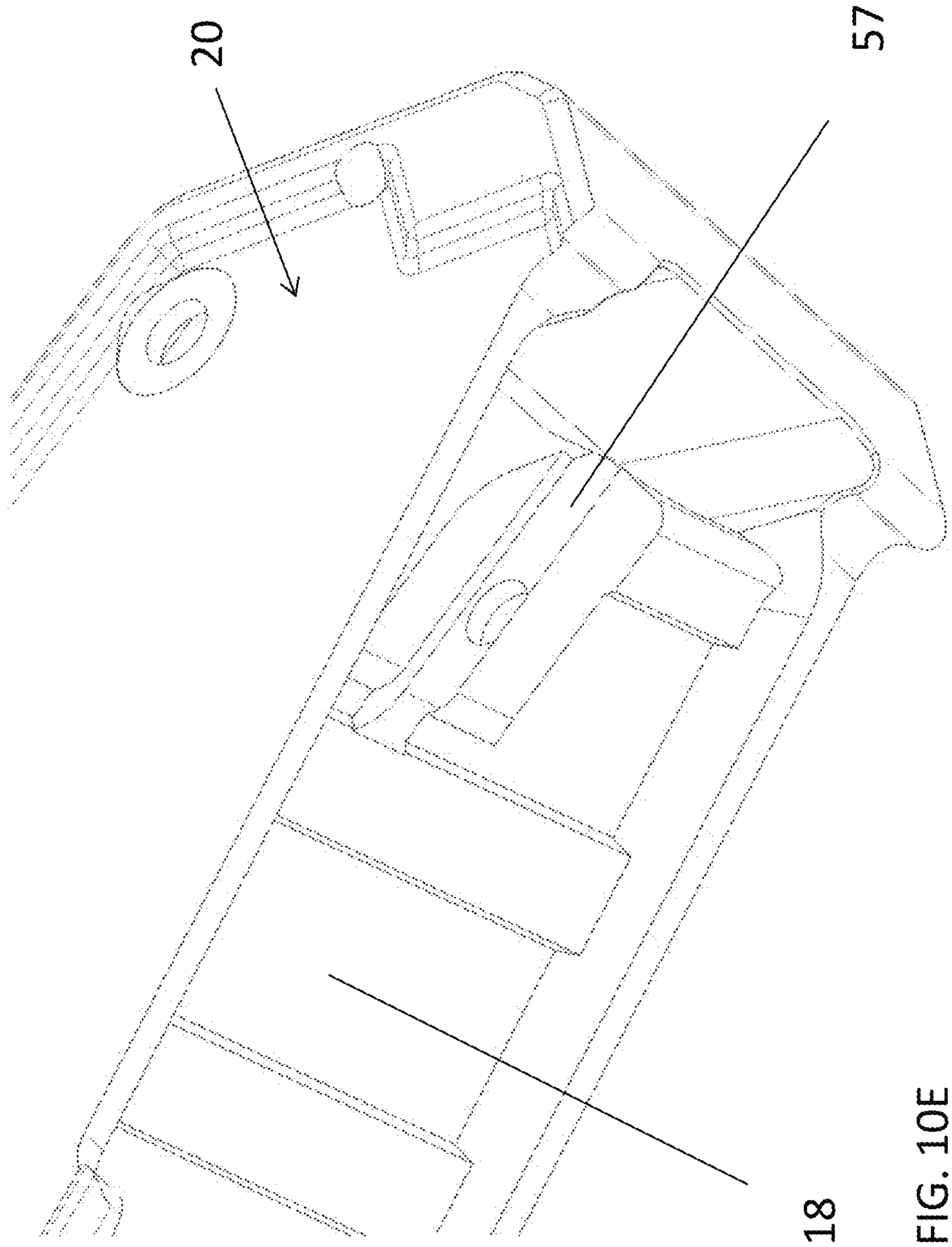


FIG. 10E

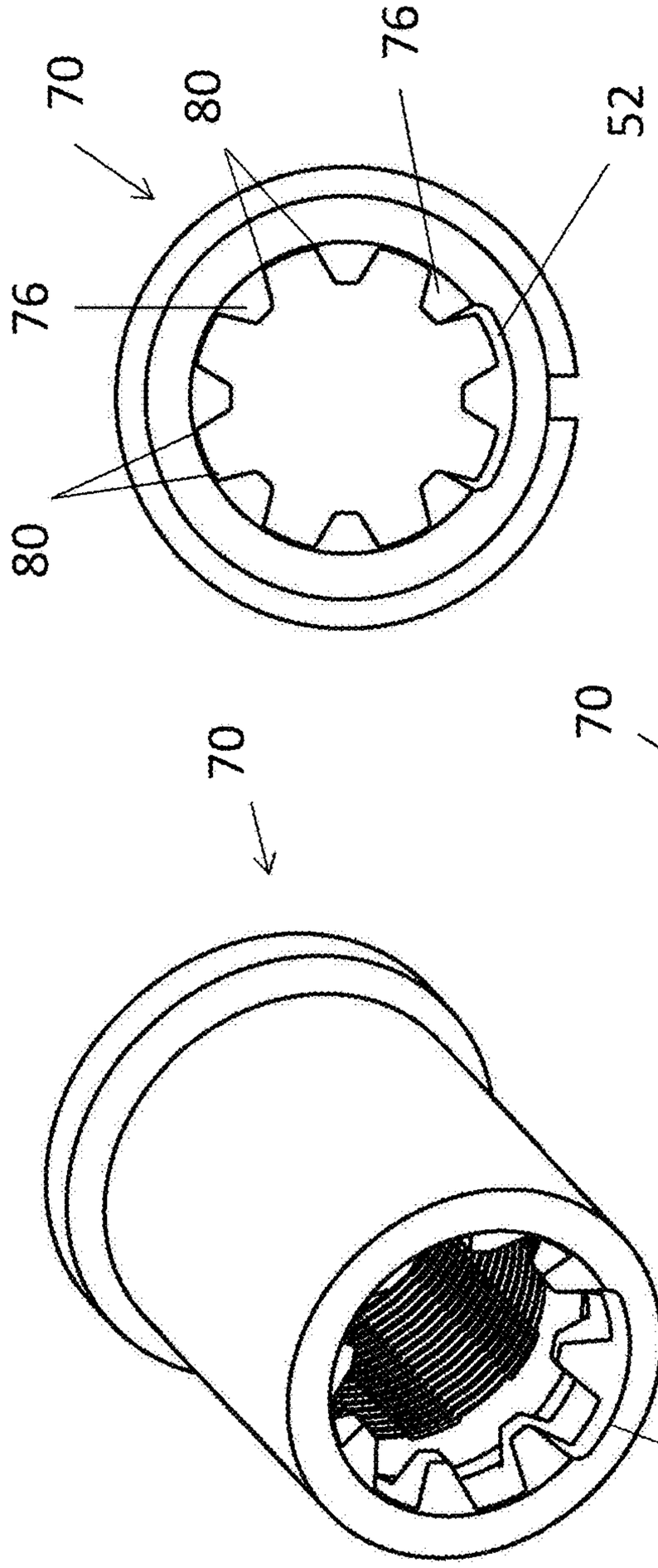


FIG. 11A

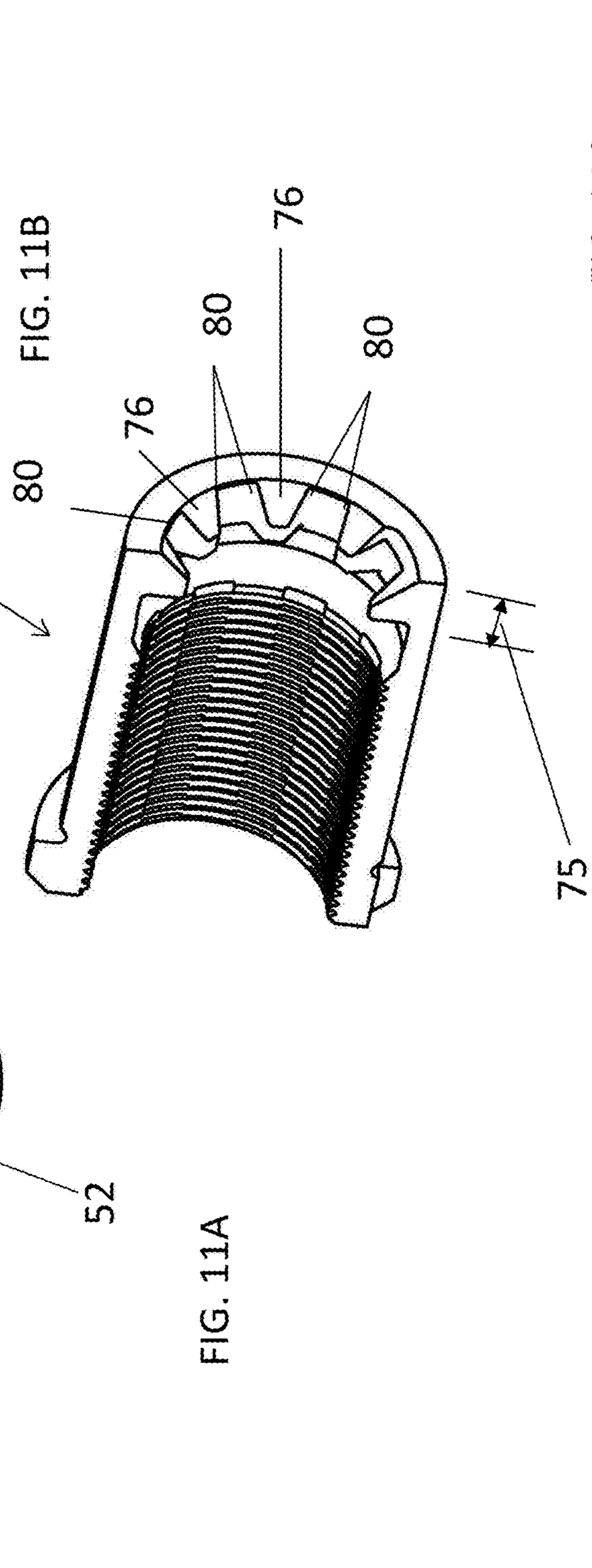


FIG. 11B

FIG. 11C

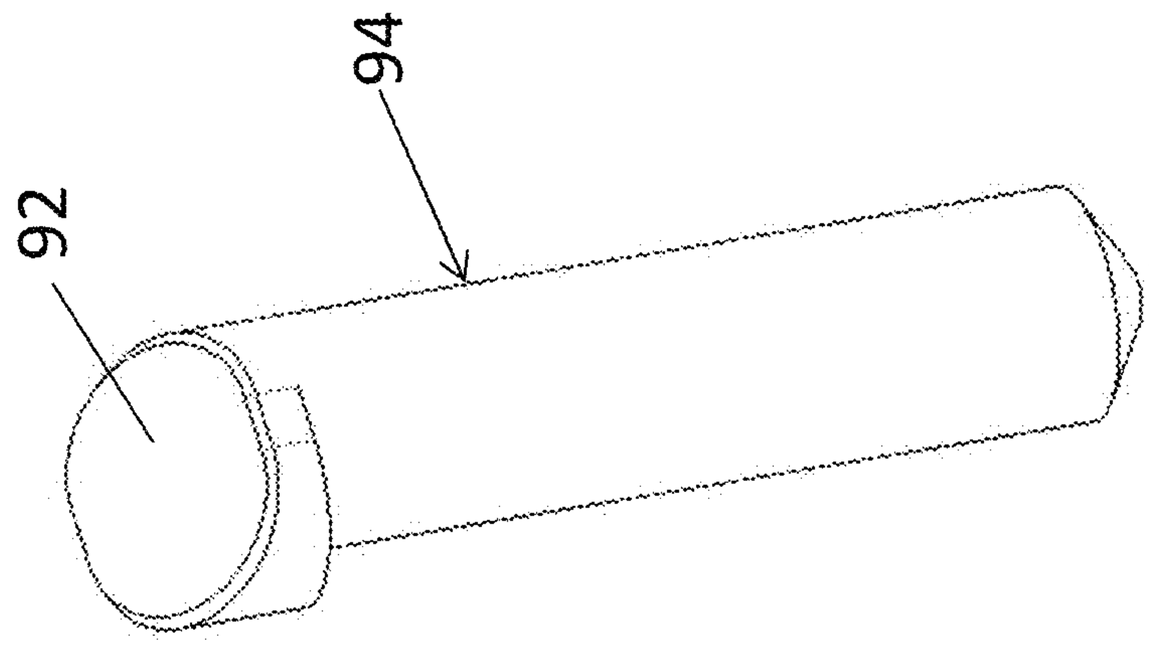


FIG. 13B

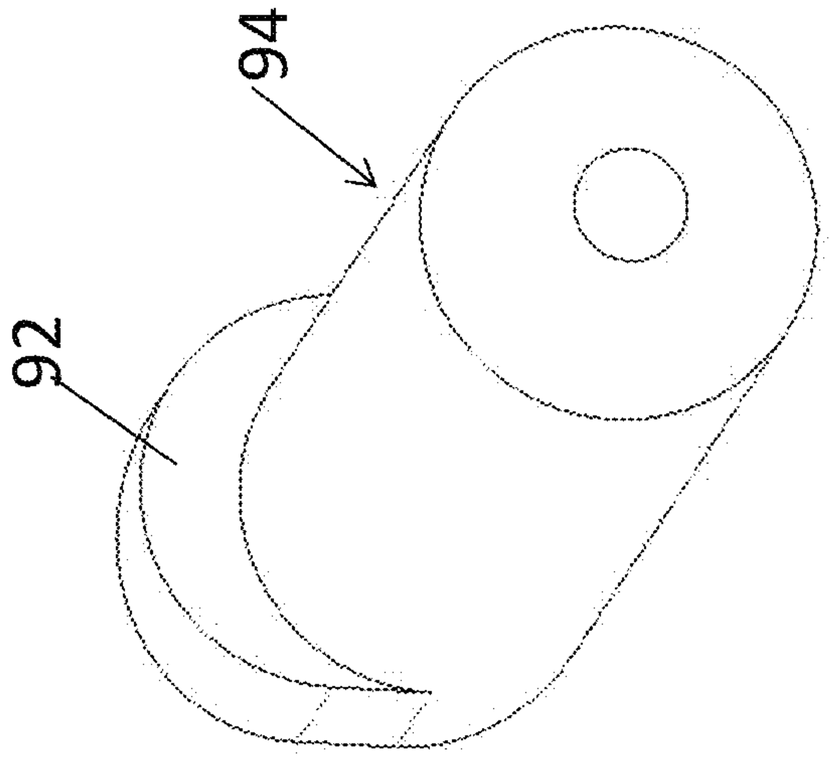


FIG. 13A

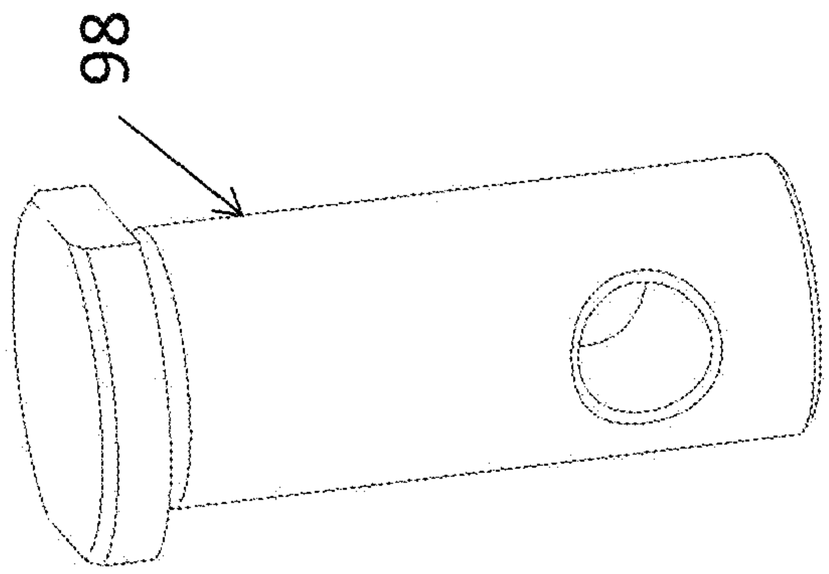
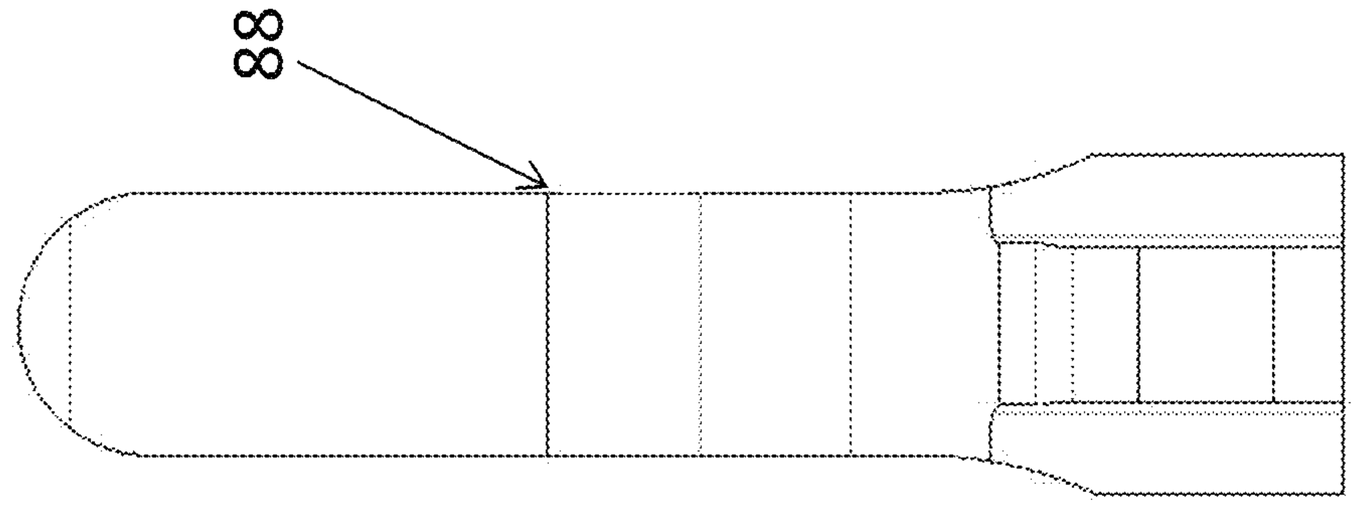


FIG. 12



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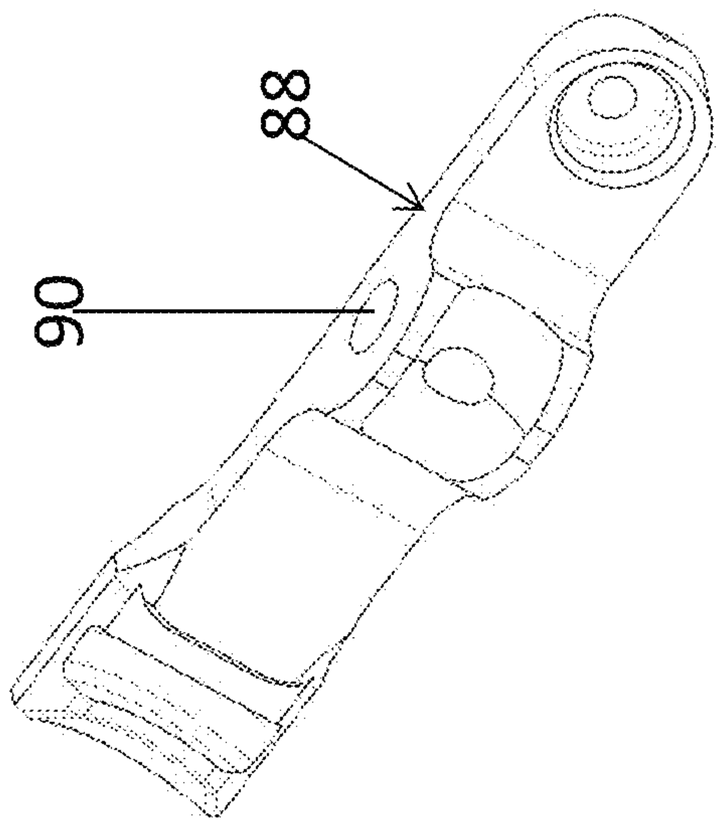

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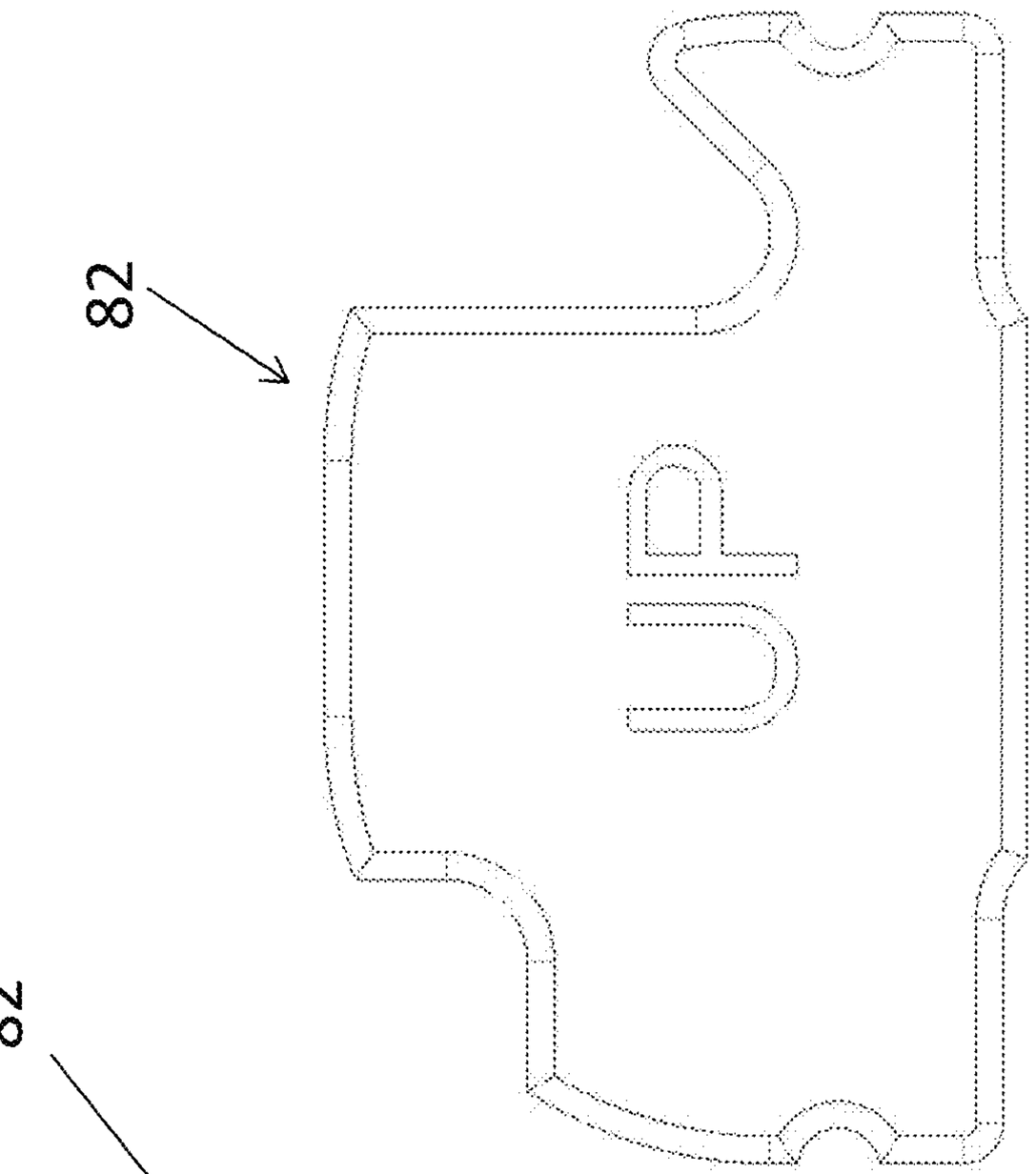

FIG. 15B

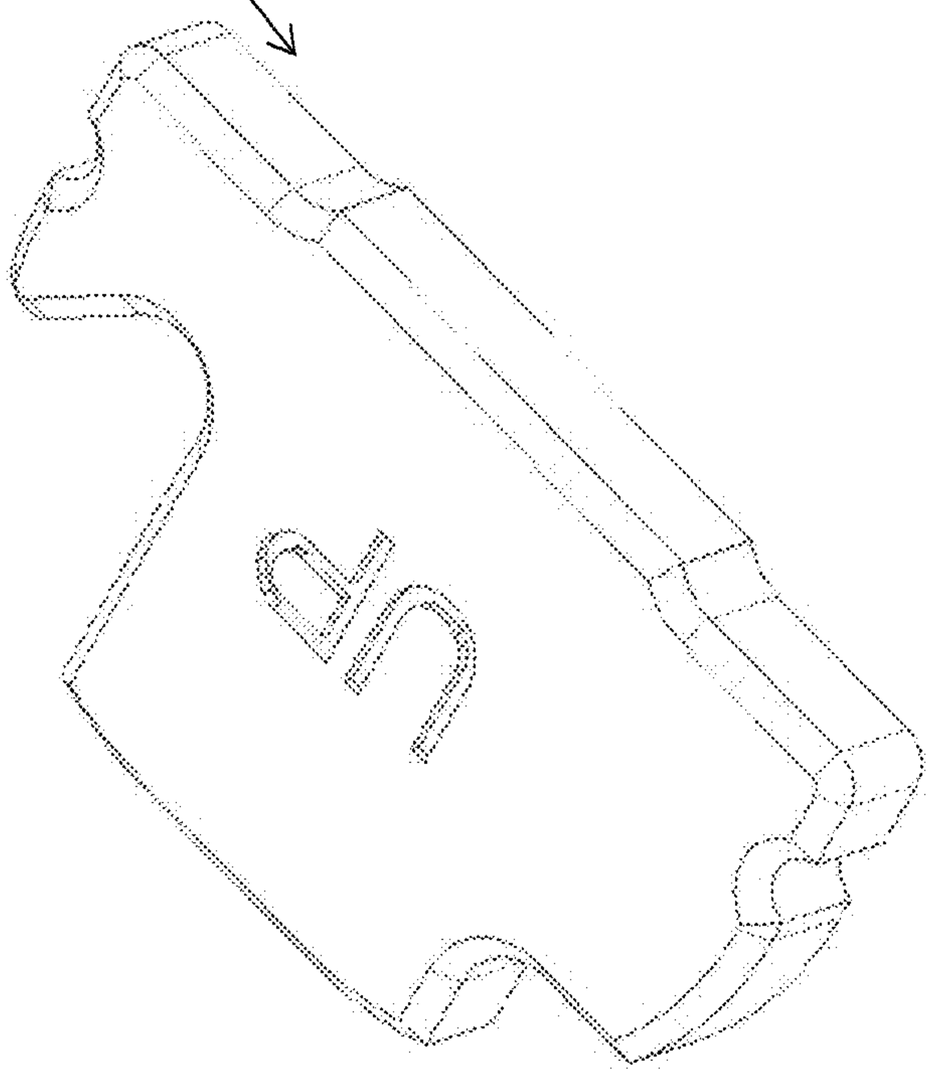

FIG. 15A

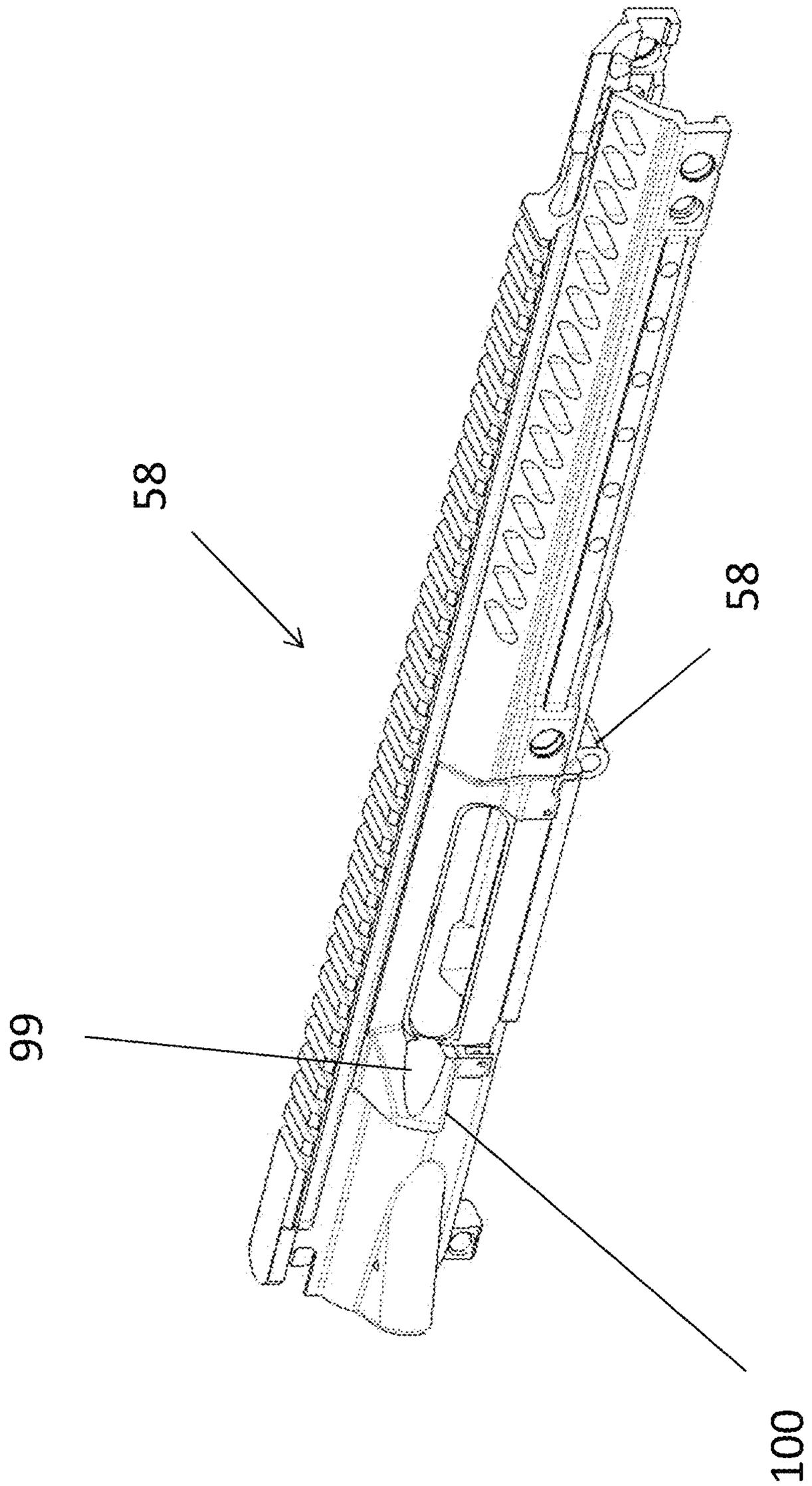

FIG. 16

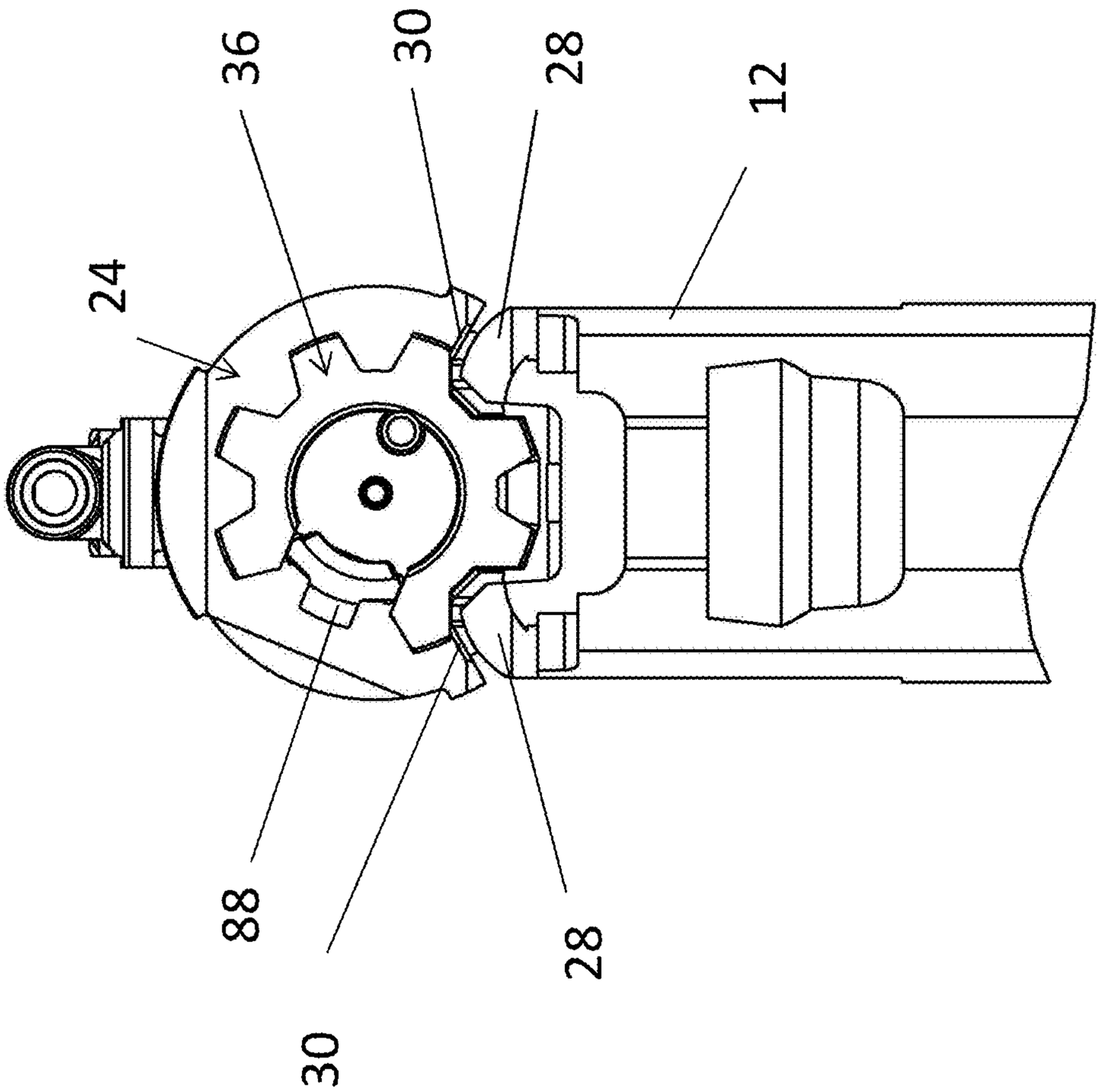

FIG. 17

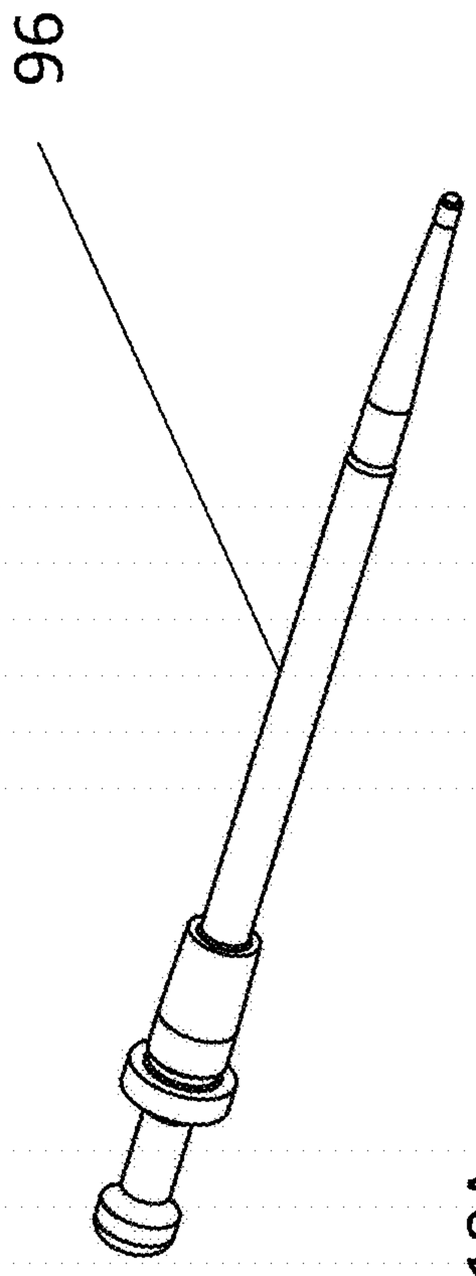

FIG. 18A

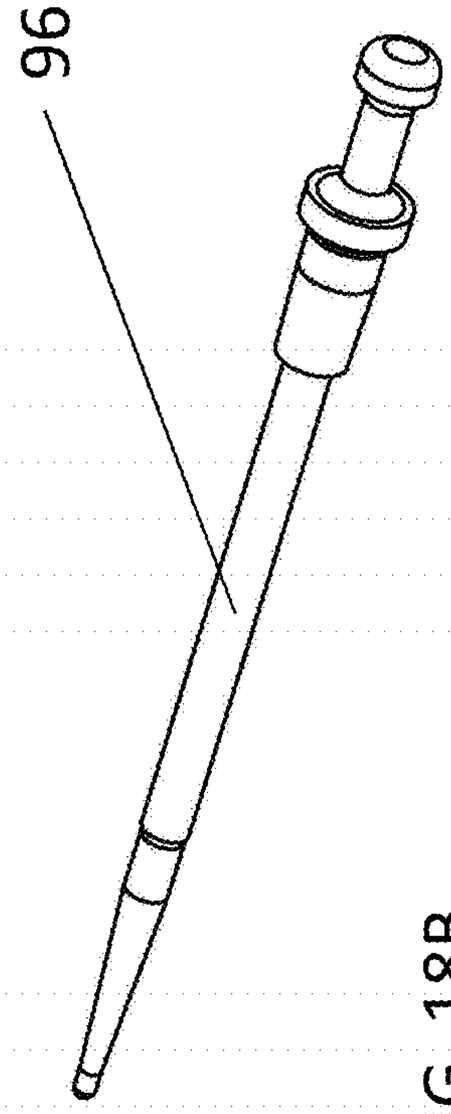

FIG. 18B

FIREARM

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 14/307,315, filed on Jun. 17, 2014, which claims the benefit of U.S. Provisional Patent Application Ser. No. 61/868,427, filed Aug. 21, 2013, the contents each of which are incorporated herein by reference thereto.

BACKGROUND OF THE INVENTION

The subject matter disclosed herein relates to firearms or rifles and, more particularly, modular automatic or semi-automatic firearms or rifles.

There are conventional semi-automatic or automatic firearms that are capable of firing a single fixed type of round, for example, a 7.62×51 mm (a.k.a. 7.62×51 NATO) round or a similar .308 caliber round also used are 5.56 mm×45 mm rounds.

If a user of the firearm desires to fire a different round, for example, a 7.62×39 mm round, such as in an environment where the 7.62×39 mm ammunition is more readily available, or for training or to save cost, the user is generally required to have a separate firearm capable of firing the different round. However, current rifles capable of firing 7.62×39 mm ammunition are generally of certain configuration such as an AK 47 rifle or firearm. Still further, rifles or firearms capable of firing 7.62×51 NATO rounds or .308 rounds have a configuration that may be separate and distinct from the AK 47. Accordingly, if a user is desirous of using 7.62×39 mm rounds they may be limited to certain types of firearms.

Accordingly, it is desirable to provide a rifle or firearm other than an AK 47 that is capable of firing a 7.62×39 mm round.

SUMMARY

According to one embodiment, a rifle is provided. The rifle having: an upper receiver; a lower receiver, the upper receiver being removably secured to the lower receiver, wherein the lower receiver is configured to removably receive and secure a magazine therein, the magazine being configured to hold at least 30 rounds of a 7.62×39 mm ammunition; and a bolt configured to be received within a bolt carrier and wherein at least the bolt and bolt carrier are configured to have some but not all dimensions associated with a bolt and bolt carrier used with a rifle configured to fire a 7.62×51 mm round and wherein at least the bolt and bolt carrier are configured to have some but not all dimensions associated with a bolt and bolt carrier used with a rifle configured to fire a 5.56 mm×45 mm round.

A rifle configured for firing a 7.62×39 mm round, comprising: an upper receiver; a lower receiver, the upper receiver being removably secured to the lower receiver, wherein the lower receiver is configured to removably receive and secure a magazine therein, the magazine being configured to hold at least 30 rounds of a 7.62×39 mm ammunition; and wherein a magazine well of the lower receiver is configured to receive an adapter at a front of the lower receiver wherein the adapter is constructed out of steel while the lower receiver is constructed out of aluminum.

In another embodiment, a rifle is provided. The rifle being configured for firing a 7.62×39 mm round. The rifle including: an upper receiver; a lower receiver, the upper receiver being removably secured to the lower receiver, wherein the lower receiver is configured to removably receive and secure a magazine therein, the magazine being configured to hold at least 30 rounds of a 7.62×39 mm ammunition; a barrel; a barrel extension; a bolt configured to be received within a bolt carrier and wherein at least the bolt and the bolt carrier are configured to have some but not all dimensions associated with a bolt and bolt carrier used with a rifle configured to fire a 7.62×51 mm round and wherein at least the bolt and bolt carrier are configured to have some but not all dimensions associated with a bolt and bolt carrier used with a rifle configured to fire a 5.56 mm×45 mm round; and wherein the barrel extension is configured so that a nose of a 7.62×39 mm round enters a chamber end of the barrel before a back of a cartridge case of the 7.62×39 mm round leaves a pair of feed lips of the magazine.

In yet another embodiment, a rifle is provided. The rifle being configured for firing a 7.62×39 mm round. The rifle including: an upper receiver; a lower receiver, the upper receiver being removably secured to the lower receiver, wherein the lower receiver is configured to removably receive and secure a magazine therein, the magazine being configured to hold at least 30 rounds of a 7.62×39 mm ammunition; and wherein a magazine well of the lower receiver is configured to receive an adapter at a front of the lower receiver.

In yet another embodiment, a rifle is provided. The rifle being configured for firing a 7.62×39 mm round. The rifle including: an upper receiver; a lower receiver, the upper receiver being removably secured to the lower receiver, wherein the lower receiver is configured to removably receive and secure a magazine therein, the magazine being configured to hold a plurality of rounds of a 7.62×39 mm ammunition; and wherein a magazine well of the lower receiver is configured to receive an adapter at a front of the lower receiver.

These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. **1** is a side perspective view of one non-limiting exemplary embodiment of the present invention;

FIG. **1**A is cross sectional view of the rifle illustrated in FIG. **1**;

FIG. **1**B is an enlarged view of the cross sectional view illustrated in FIG. **1**A;

FIG. **2** is a side view of the rifle illustrated in FIG. **1**;

FIG. **3** is an exploded view of the rifle illustrated in FIGS. **1** and **2**;

FIG. **4** is a perspective view of a magazine contemplated for the rifle illustrated in at least FIGS. **1-3**;

FIG. **5** is a perspective view of a bolt carrier contemplated for the rifle illustrated in at least FIGS. **1-3**;

FIG. **5**A is an end view of the bolt carrier illustrated in FIG. **5**;

FIG. **6**A is a perspective view of a bolt contemplated for use with the bolt carrier illustrated in FIGS. **5** and **6**;

FIG. **6**B is an end view of the bolt illustrated in FIG. **6**A;

FIG. **6**C is a side view of the bolt illustrated in FIG. **6**A;

FIGS. **7**A-**7**C are perspective views of a lower receiver contemplated for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **8** is a perspective view of a lower assembly with the lower receiver removed;

FIGS. **9**A and **9**B are perspective views of a magazine catch configured for use with the lower receiver illustrated in at least FIGS. **7**A-**7**C;

FIGS. **10**A-**10**C are perspective views of an adapter configured for use with the lower receiver illustrated in at least FIGS. **7**A-**7**C;

FIGS. **10**D and **10**E are perspective views of a forward portion of a lower receiver configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **11**A is a perspective view of a barrel extension configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **11**B is an end view of a barrel extension configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **11**C is a perspective cross-sectional view of a barrel extension configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **12** is a perspective view of a cam pin configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIGS. **13**A and **13**B are perspective views of an extractor pin configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **14**A is a perspective view of an extractor configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **14**B is a side view of an extractor configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIGS. **15**A and **15**B are perspective views of a magazine stop configured for use with the rifle illustrated in at least FIGS. **1**-**3**;

FIG. **16** is a perspective view of a portion of an upper receiver according to one alternative embodiment and configured for use with various embodiments of the present invention;

FIG. **17** is a partial cross-sectional view illustrating the bolt carrier magazine relationship from a front view of the rifle; and

FIGS. **18**A and **18**B are perspective views of a firing pin configured for use with the rifle illustrated in at least FIGS. **1**-**3**.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the FIGS., there is shown, an automatic or semi-automatic firearm, rifle, gun or weapon **10** capable of automatic or semiautomatic fire incorporating features in accordance with various embodiments of the present invention. Although the features of such embodiments will be described with reference to the embodiments shown in the drawings, it should be understood that the described features can be embodied in many alternate forms of embodiments. In addition, any suitable size, shape or type of elements or materials could be used.

In accordance with an embodiment of the present invention components of an existing firearm or rifle configured to fire a 7.62×51 mm round were modified to fire a 7.62×39 round. The modified rifle **10** is illustrated in at least FIGS. **1**-**3**.

As shown, the rifle **10** was configured for use with a curved or "banana" type magazine **12** that is capable of holding 30 rounds of 7.62×39 mm rounds. Magazine **12** is commonly associated with AK-47 firearms. One non-limiting embodiment of such a magazine is available from U.S. Palm as a polymer magazine. Of course, various embodiments of the present invention are also contemplated for use with magazines that may be capable of holding greater or less than 30 rounds.

The changing of a caliber of an existing firearm or rifle may require a unique magazine configuration. As in the present case, a 30 round magazine for 7.62×39 mm rounds has a unique configuration. In one embodiment, the illustrated magazine **12** was selected for use with rifle **10**. Of course, exemplary embodiments of the present invention are not limited to the specific configurations disclosed herein. The magazine **12** then has to be positioned in relation to a chamber end **14** of a barrel **16** of the rifle **10**. The aforementioned positioning of the magazine **12** with respect to the chamber end **14** is determined by left-to-right, front-to-back, and up-and-down positioning with respect to the chamber end **14** of the barrel **16**.

The left-to-right positioning of the magazine **12** is usually straight forward namely, center the magazine **12** with respect to a center line of the barrel **16**. For up-and-down (vertical) positioning of the magazine **12** the same is located so that a top round in the magazine **12** is as close to the barrel centerline as possible when the magazine is inserted into a magazine well **18** of a lower receiver **20** of the rifle **10**. This location provides an optimum feeding angle, however, care should be taken so that the magazine **12** is not too high in the magazine well **18** because once a round is fed into the barrel chamber and fired, the shell of the fired round has to be extracted horizontally rearward (straight back) and it is undesirable to have the extracted round contact any part of the magazine **12** during extraction or hit a next round in the magazine that is about to be fed into the barrel chamber.

Accordingly, a bottom surface **22** of a bolt carrier **24** is configured to protrude low enough into the top of the magazine **12** in order to hold down the next round in the magazine that is about to be fed so that the round in the magazine is out of the way of the round being extracted. However, a balance has to be achieved in that the bottom surface **22** of the bolt carrier **24** does not contact any part of the magazine **12** during operation of the rifle **10**.

It is also necessary that the bottom surface **22** of the bolt carrier **24** interacts with a hammer **26** properly ensuring that the hammer will rotate enough to cock as the bolt carrier **24** moves rearward so that the hammer **26** stays cocked and does not follow down as the bolt carrier **24** moves forward.

Another requirement necessitates a clearance in the bolt carrier **24** for the magazine feed lips **28**. In accordance with an embodiment of the present invention and in order for the bolt carrier **24** to always clear the magazine feed lips **28** while cycling, large form cuts **30** had to be machined into both sides of the bottom **22** of the bolt carrier **24**. These form cuts **30** are slightly larger than the shape of the magazine feed lips **28** and are configured to accommodate the length of the magazine **12**.

When adding these cuts **30** to the bolt carrier **24** it was necessary to have the cuts **30** protrude inward towards a center **32** of the bolt carrier **24** so much that an inside diameter **34** of the bolt carrier **24** (where a bolt **36** resides) had to be made smaller so these cuts wouldn't extend into the inner diameter **34** of the bolt carrier **24**. By reducing an inner diameter **34** of the bolt carrier **24** an outside diameter (OD) **38** of a bolt **36** received therein had to be made smaller.

In accordance with various non-limiting embodiments of the present invention, a range of the inside diameter **34** of the bolt carrier **24** may be 0.563+/−0.001 inches while a range of the outside diameter **38** of the bolt **36** may be 0.556+/−

0.001 inches. For example and in another non-limiting embodiment, a range for the dimension of the inside diameter **34** of the bolt carrier **24** may be within 0.53 to 0.66 inches and the range of the outside diameter **38** of the bolt **36** may be with 0.52 inches to 0.650 inches. It is, of course, understood that the aforementioned ranges are provided as non-limiting examples and various embodiments of the present invention contemplate ranges greater or less than the aforementioned values.

In order to properly position the magazine **12** front-to-back with respect to the rifle **10**, the lower receiver **20** has to be configured so that the lower receiver forging has enough material to accommodate the magazine well **18** required for the magazine **12**.

In one embodiment, the magazine well **18** of lower receiver **20** extends downwardly in the direction of arrow **21** away from an interface of the lower receiver **20** to an upper receiver **58**. In addition, the magazine well **18** extends in the direction of arrow **21** such that it is also positioned forward or in front of a forward vertical wall **23** in front of a trigger **81** of the rifle.

The lower receiver **20** further comprises an adaptor **40** so that the rifle **10** can operate with a magazine having a plurality of 7.62×39 mm rounds. Adapter **40** allows material at a front **42** of the lower receiver **20** forging (in the front of the magazine well area **18**) to be removed and then modified with adapter **40**. The positioning of adapter **40** at the front **42** of the lower receiver **20** allows magazine **12** to be positioned into the rifle **10** and in particular into the magazine well **18** of lower receiver **20**. The configuration of magazine **12** requires that a forward end **44** of the magazine **12** be inserted into the magazine well area **18** first and then the magazine **12** is rotated rearwardly with respect to the rifle **10** until it is latched into the lower receiver **20**.

Adapter **40** allows the forward end **42** of the lower receiver **20** to be reinforced since a portion of the forward end **42** of the lower receiver **20** had to be removed to accommodate the configuration of magazine **12** (e.g., banana style configurations) since the lower receiver **20** is configured to have a magazine well **18** in front of a forward wall **23** in front of the trigger **81**. Adapter **40** is configured to position and hold therein a front tab **46** on the top/front of the magazine **12** and provide clearance for the rounds feeding out of the magazine as well as providing a feed ramp **50** for the left and right rounds as they exit the magazine **12** at an angle that aimed the rounds towards a barrel extension feed ramp **52** and into the barrel chamber **14**, consistently and without binding the rounds between the magazine feed lips **28** and the front adapter block **40** before they exit the magazine **12** while being fed. As illustrated, feed ramp **50** may comprise a pair of scallop cuts **51**.

In one embodiment, adapter **40** may be made from steel as opposed to aluminum that is used for the lower receiver. This provides a more durable surface for interaction with the front tab **46** of the magazine **12** which is also steel and may be molded into the plastic magazine **12**. Accordingly and in one embodiment, the lower receiver **20** may be constructed out of aluminum or alternatively an aluminum alloy while the adapter **40** may be constructed out of steel or alternatively a steel alloy. As such, the lower receiver **20** is configured to portions formed from two different materials each having different characteristics (e.g., adapter **40** and lower receiver **20**).

Adapter **40** also includes a pair of openings **54** and associated bosses or flanges **55** positioned to receive a front lug **56** of an upper receiver **58** that allows the same to be removably secured to the lower receiver **20** via a takedown pin **77**.

The distance front lug **56** protrudes from the upper receiver **48** was shortened in order to fit into adapter **40** and allow use of the front adapter block **40**.

Also illustrated in at least FIGS. **10**D and **10**E is that sidewall portions of the magazine well **18** are configured to have grooves **57** into which complementary features **59** of the adapter **40** are slidably received prior to the securement of adapter **40** to lower receiver **20**. Adapter **40** may be secured to the lower receiver **20** in any suitable manner (e.g., pins, rivets, screws or alternatively welds or combinations thereof). Still further, adapter **40** may be secured to the lower receiver **20** in a manner that allows it to be removed and/or replaced. In yet another alternative, the adapter **40** or its configuration may be permanently secured to or integrally formed with the lower receiver **20** so that it cannot be removed from the lower receiver **20**.

It is, of course, understood that in alternative exemplary embodiments lower receiver **20** itself may be configured to resemble the combined configuration of lower receiver **20** and adapter block **40** or in other words lower receiver **20** may be cast or forged large enough as to not require an adapter block **40** and/or may be constructed out of other materials.

Due to limitations with regard to the location of the barrel **14** and the barrel extension **70** the length **72** of the bolt lugs **74** on the 7.62×51 mm style bolt **36** (the front-to-back distance of the lug) was made the same as on the shorter 5.56 bolt lug, which allowed a corresponding length **75** on the mating lugs **76** on the 7.62×51 mm style barrel extension **70** to be made the same length as on a 5.56 barrel extension. Both sets of lugs where then strengthened by changing their shape (angling their sides to provide an increased thickness with respect to the longer length of the same). In addition, larger corner radii **78**, **80** were also provided on the bolt **78** and the barrel extension **80**. These changes to the lugs on the bolt **36** and barrel extension **70** allowed a 7.62×51 mm style barrel to be moved rearward a corresponding amount ensuring that the nose of the bullet enters the chamber before the back of the cartridge case left the magazine feed lips. This will provide consistent feeding and ensure that the round does not jump out of the magazine **12** before it has started into the barrel **16**.

In addition, the chosen front-to-back position for the 7.62×39 magazine **12** and the front adapter block **40** allowed a positioning plate **82** to be located in the back of the magazine well **18** of the lower receiver **20**. The configuration of plate **82** located the magazine **12** vertically and front-to-back in conjunction with the front adapter block **40**.

In order to secure, and release magazine **12** a spring biased magazine catch **84** is pivotally mounted to the lower receiver **20** for pivotal movement about a pin **101** for movement between at least a first position and a second position. Magazine catch **84** is configured to have a protrusion or surface **86**, which in one embodiment may be an end surface **86** or any other surface or protrusion **86** that is configured to engage and release a rear lug **89** of magazine **12** as the magazine catch **84** moves between the first and second positions. For example and in one non-limiting embodiment, the magazine catch **84** is spring biased by a spring **87** into a first position (see at least FIG. **1**B) wherein protrusion **86** engages lug **89** when the magazine **12** is inserted into well **18**. In one non-limiting embodiment, the spring **87** may be a torsion spring having a pair of arms or legs **103** wherein one of the pair of arms or legs **103** of the

spring **87** applies a force generally in the direction arrow **105** to end **86** so that the magazine catch **84** or at least end **86** is spring biased into the first position. In one non limiting embodiment, the leg or arm **103** engages an ear, tab or protrusion **107** of the magazine catch **84** in order to provide the biasing force in the direction of arrow **105**. Accordingly and when the magazine **12** is inserted into an empty magazine well **18**, the front tab **46** is inserted first until it engages adapter **40** and then the magazine **12** is pivoted in the direction of arrow **91** thereafter lug **89** will contact a surface of the magazine catch **84** proximate to end or protrusion **86** so that the magazine catch **84** is moved or pivoted about pin **101** from the first position against the biasing force of spring **87** so that the end or protrusion **86** moves rearwardly in a direction generally opposite to arrow **105** towards the forward wall **23** until lug **89** passes end **86** as the magazine **12** is pivoted or rotated in a direction generally opposite to that of arrow **91**. Thereafter, the biasing force of spring **87** will move the end or protrusion **86** forward back generally in the direction of arrow **105** into the first position (See at least FIG. **1**B) of the magazine catch **84** so that the lug **89** is captured by end or protrusion **86**.

In one non-limiting embodiment, the lug **89** may be captured between end or protrusion **86** and plate **82**. Thereafter and in order to release the magazine **12** a user applies a force generally in the direction of arrow **105** to an end **95** of the magazine catch **84** in order to pivot the magazine catch about pin **101** and thus move at least the end or protrusion **86** of the magazine catch **84** away from the first position in a direction generally opposite to the direction of arrow **105** against the biasing force of spring **87** so that lug **89** can freely pass by end or protrusion **86** and the magazine **12** can be removed from the magazine well **18** by pivoting or rotating it about tab **46** in a direction generally opposite to arrow **91**. In other words application of a force generally in the direction of arrow **105** against end **95** moves end **86** generally in a direction opposite to that of arrow **105** and thereafter release of the force in the direction of arrow **105** against end **95** will allow end **86** to move generally in the direction of arrow **105** due to the biasing force of spring **87**.

As illustrated in at least FIGS. **9**A and **9**B, the magazine catch **84** has two portions **109** that depend angularly away from an intermediate portion **111**, which has an opening **115** into which pin **101** is inserted and provides an axis of rotation or pivotal movement of magazine catch **84** between the first position wherein end **86** engages and secures lug **89** between end **86** and plate **82** and the second position wherein the lug **89** is free to pass by end **86**. This configuration allows the magazine catch **84** to extend upwardly along the side of the magazine well **18** in order to provide the desired movement between the first and second positions without interfering with the insertion and release of the magazine **12** into the magazine well **18** nor interfere with the operation of the fire control parts (hammer, trigger, etc.) while also clearing a trigger guard typically used in a standard 7.62×51 lower receiver and yet not protrude into the magazine well **18** in a manner that would interfere with the insertion or removal of the magazine **12** into the magazine well **18** nor protrude into the trigger area. Also illustrated in at least FIG. **2** is that magazine catch **84** is configured so that end **95** protrudes below the bottom of a trigger guard **83** located below the trigger **81** so a user can apply a force in the direction of arrow **105** in order to release the magazine **12** via pivotal movement of magazine catch **84**.

As mentioned above and since the magazine well **18** of lower receiver **20** has a larger vertical height (e.g., approximately 2 inches (of course, other dimensions greater or less than 2 inches are contemplated to be within the scope of various embodiments of the present invention) versus approximately 1 inch or any other dimension) than rifles typically used with magazines configured for use in a AK-47 rifle type magazines to latch them in place, this required the magazine catch **84** to reside deeper (higher vertically) into the lower receiver **20** and with respect to the magazine well **18** and snake its way down and have an end portion **95** extend out in front and of and below the trigger guard **83** or trigger guard area, bypassing the trigger finger area of the lower receiver **20**. As mentioned above, the magazine well **18** of lower receiver **20** extends downwardly in the direction of arrow **21** such that the magazine well **18** or at least a portion thereof is also positioned forward or in front of the forward vertical wall **23** located in front of the trigger **81**.

Due to the magazine catch **84** extending upwardly, the magazine catch **84** also had to be configured to allow the magazine **12** to be installed into the magazine well **18** while a person pivots the magazine **12** into place and then must be able to securely latch-in and secure the magazine **12** in place.

The magazine catch **84** is also configured to accommodate for many different manufacturer's magazines that all latch similarly but had similar but slightly varying shapes and dimensions at the back of their magazine tubes. The magazine catch **84** is also configured to not interfere with any of the existing fire control parts (hammer, trigger, etc.) and it had to clear the standard 7.62×51 mm trigger guard, yet not protrude into the magazine well **18** in a manner that would interfere with the insertion or removal of the magazine **12** into the magazine well **18** nor protrude into the trigger area. The magazine catch **84** also had to have a return spring **87** for the magazine catch **84** that would fit into the area of the lower receiver **20** above the magazine catch **84** yet not interfere with any other components. In one embodiment, the magazine catch **84** may be pivotally mounted into a channel **93** located adjacent to the magazine well **18**. Of course, other configurations and locations are contemplated to be within various embodiments of the present invention. In one embodiment, plate **82** may be secured into a slot, channel or groove **97** located in or above channel **93**.

Additional modifications included movement of the bolt breech face **85** slightly rearward so a new extractor could be designed that was partially based on the 5.56 extractor in the rear due to the bolt OD reduction and similar to the 7.62×51 in the front, yet completely new for the 7.62×39. By determining the weakest point of a 5.56 style extractor and a 7.62×51 style extractor, the breech face depth on the bolt **36** was moved rearward (about half the distance of a 7.62×51 breech face depth vs a 5.56 breech face depth) to allow a strengthened extractor hook **88** to be used. To increase leverage from the extractor spring area of the extractor to the extractor hook area of the extractor for improved extraction, the extractor pivot hole **90** was moved forward on the extractor **88** and in the bolt **36** to allow an approximate 50/50 ratio of spring force to extractor hook force. This required an elongated head **92** on the extractor pivot pin **94** which kept the head **92** of the pin **94** constantly captured by the inside of the bolt carrier **24**, to prevent the extractor pivot pin **92** from falling out of the bolt **36** when the bolt **36** was in its unlocked position.

A firing pin **96** also had to be revised (shortened in the middle and shortened for overall length) based on the amount the bolt **36** was shortened due to the bolt lugs **74** length change and breech face depth change. FIGS. **18**A and

18B are perspective views of a firing pin **96** configured for use with exemplary embodiments of the present invention.

FIG. **12** is a perspective view of a non-limiting configuration of a cam pin **98** configured for securing the bolt **36** to bolt carrier **24**.

FIG. **16** is a perspective view of a portion of an upper receiver **58** according to one alternative embodiment wherein a cut **99** may be added to the shell deflector **100** of the upper receiver **58**. In some implementations, the cut aids in ejection of the 7.62×39 casings.

FIG. **17** is a partial cross-sectional view illustrating the bolt carrier **24**/magazine **12** relationship from a front view.

Reference is made to the following U.S. Pat. Nos. 6,792,711; 7,131,228; and 7,775,150 the contents each of which are incorporated herein by reference thereto. Reference is also made to the following U.S. Patent Publications US 2012/0167433 and US 2012/0297656 the contents each of which are also incorporated herein by reference thereto.

As used herein, the terms "first," "second," and the like, herein do not denote any order, quantity, or importance, but rather are used to distinguish one element from another, and the terms "a" and "an" herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item. In addition, it is noted that the terms "bottom" and "top" are used herein, unless otherwise noted, merely for convenience of description, and are not limited to any one position or spatial orientation.

The modifier "about" used in connection with a quantity is inclusive of the stated value and has the meaning dictated by the context (e.g., includes the degree of error associated with measurement of the particular quantity).

In the preceding detailed description, numerous specific details are set forth in order to provide a thorough understanding of various embodiments of the present invention. However, those skilled in the art will understand that embodiments of the present invention may be practiced without these specific details, that the present invention is not limited to the depicted embodiments, and that the present invention may be practiced in a variety of alternative embodiments. Moreover, repeated usage of the phrase "in an embodiment" does not necessarily refer to the same embodiment, although it may. Lastly, the terms "comprising," "including," "having," and the like, as used in the present application, are intended to be synonymous unless otherwise indicated. This written description uses examples to disclose the invention, including the best mode, and to enable any person skilled in the art to practice the invention, including making and using any devices or systems. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments or only portions of the features described in an embodiment. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

What is claimed is:

1. A rifle, comprising:

an upper receiver for firing a 7.62×39 mm round;

a lower receiver, the upper receiver being removably secured to the lower receiver;

a magazine removably received and secured to a magazine well of the lower receiver, the magazine being configured to hold multiple rounds of a 7.62×39 mm ammunition;

an adapter inserted into a front of magazine well of the lower receiver;

a pair of feed lips located on a top portion of the magazine;

a bolt carrier movably received in the upper receiver; and

a pair of cuts located in a bottom portion of the bolt carrier such that the pair of feed lips will pass through the pair of cuts as the bolt carrier moves within the upper receiver, wherein an inside diameter of the bolt carrier where a bolt resides is a range of 0.53 to 0.66 inches and an outside diameter of the bolt received in the bolt carrier is in the range of 0.52 inches to 0.650 inches.

2. The rifle as in claim **1**, wherein the adapter is constructed out of steel while the lower receiver is constructed out of aluminum.

3. The rifle as in claim **1**, wherein the adapter structurally reinforces the front of the lower receiver.

4. The rifle as in claim **1**, wherein the adapter engages a front tab of the magazine when the magazine is inserted into the magazine well.

5. The rifle as in claim **1**, further comprising a magazine catch pivotally mounted to the lower receiver proximate to the magazine well such that a protrusion of the magazine catch engages a rear lug of the magazine when the magazine is inserted into the magazine well.

6. The rifle as in claim **1**, further comprising a positioning plate located in the magazine well, the positioning plate being configured to locate the magazine in the magazine well.

7. The rifle as in claim **1**, further comprising a magazine catch pivotally mounted to the lower receiver proximate to the magazine well such that a protrusion of the magazine catch engages a rear lug of the magazine when the magazine is inserted into the magazine well, wherein an end portion of the magazine catch comprising the protrusion extends outwardly in front of and below a trigger guard of the lower receiver and wherein the magazine catch has two portions that depend angularly away from an intermediate portion of the magazine catch, the intermediate portion having an opening into which a pin is inserted in order to provide an axis of rotation of magazine catch between a first position wherein the protrusion of the magazine catch engages and secures the rear lug of the magazine between the end of the magazine catch and a positioning plate located in the magazine well, the positioning plate being configured to locate the magazine in the magazine well and a second position wherein the rear lug of the magazine is free to pass by the end portion of the of the magazine catch.

8. The rifle as in claim **7**, wherein pivotal movement of the magazine catch allows the magazine to be pivoted into the magazine well from the adapter and into the magazine well such that the rear lug of the magazine is engaged by the protrusion of the magazine catch when the magazine is pivoted into the magazine well.

9. The rifle as in claim 1, wherein the magazine well of the lower receiver extends at least 2 inches in a vertical direction and the magazine is configured to have a curved shape.

10. The rifle as in claim 1, wherein the inside diameter of the bolt carrier is 0.563 inches while an outside diameter of the bolt is 0.556 inches.

11. The rifle as in claim 1, wherein the rifle further comprises a barrel with a barrel extension, wherein the barrel is configured for use with a 7.62×51 mm round and the barrel extension and the bolt are each configured for use with a 7.62×51 mm round except that a plurality of lugs of the barrel extension have a length in a front to rear direction of the rifle that is the same as a bolt extension configured for use with a 5.56×45 mm round and the bolt has a plurality of matting lugs that have a length in a front to rear direction of the rifle that is same as a bolt configured for use with a 5.56×45 mm round, such that the length of the lugs are less than a corresponding length of lugs used in a bolt extension and bolt configured for use with a 7.62×51 mm round.

12. The rifle as in claim 11, wherein a width of the lugs of the barrel extension and the bolt is increased in a direction perpendicular to the lengths of the lugs such that the width of the lugs is greater than a width of lugs of a barrel extension and a bolt configured for use with a 5.56×45 mm round.

13. The rifle as in claim 1, wherein the adapter has a feed ramp to direct rounds towards a feed ramp of a barrel extension of the rifle.

14. The rifle as in claim 13, wherein the feed ramp of the adapter comprises a pair of cuts for left and right rounds as they exit the magazine.

15. The rifle as in claim 1, wherein the adapter has a pair of complementary features received within grooves located in sidewalls of the magazine well.

16. The rifle as in claim 1, wherein the adapter has a pair of openings and associated flanges positioned to receive a front lug of the upper receiver so that the upper receiver can be removably secured to the lower receiver via a takedown pin.

* * * * *